Florida Department of Education

CTE Curriculum Frameworks

Information Technology

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Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Database and Programming Essentials**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8206400
CIP Number	0511080207
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1141 – Database Administrators
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and entry-level database and internet/web related careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, and technical skills related to database and Internet technologies skills using the latest industry tools. This curriculum is project-based and modeled after the Oracle Academy.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

It is recommended that students complete Algebra I and a programming/flow-charting course concurrently or prior to taking this program.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
8206410	Database Fundamentals	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G Any Academic Field PLUS appropriate industry certification.	.5 credit	15-1151	2	CT
8206420	Data Control and Functions		.5 credit	15-1151	2	CT
8206430	Specialized Database Programming		1 credit	15-1151	3	CT
8206440	Specialized Database Applications		1 credit	15-1151	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Develop an awareness of the changes taking place in the information age and how they fit into an evolving society.
11.0 Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs.
12.0 Develop the process of creating an entity by identifying relationships.
13.0 Formulate and assemble initial entity relationship by expanding on modeling concepts.
14.0 Consider the degree and optionality of relationships of entities.
15.0 Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and Many-to-Many (M:M) relationships for building entity relationship diagrams.
16.0 Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships.
17.0 Demonstrate proficiency in designing and adding complexity to a logical relationship.
18.0 Apply the complex logical information by fine tuning entities and the process for relating them.
19.0 Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved.
20.0 Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion of mistakes.
21.0 Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data.
22.0 Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database.
23.0 Extend the logical presentation model by normalizing the data and mapping the management system.
24.0 Apply techniques for building a storage management system by creating a website using templates and wizards.
25.0 Demonstrate storage closet design and functionality by constructing a group business presentation.
26.0 Demonstrate comprehension of database modeling competency through group presentation.
27.0 Demonstrate language arts knowledge and skills.
28.0 Demonstrate mathematics knowledge and skills.
29.0 Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints.

30.0 Demonstrate comprehension of aspects of SQL Language interface by writing basic SQL statements.
31.0 Demonstrate proficiency working with columns, characters, and rows in SQL.
32.0 Demonstrate proficiency in using SQL comparison operators.
33.0 Demonstrate proficiency in using logical comparisons and precedence rules.
34.0 Demonstrate proficiency using SQL single row functions.
35.0 Demonstrate proficiency displaying data from multiple tables.
36.0 Demonstrate proficiency aggregating data using GROUP functions.
37.0 Demonstrate proficiency utilizing subqueries.
38.0 Demonstrate proficiency producing readable output with SQL language interface, reporting tool and manipulating data.
39.0 Demonstrate proficiency creating and managing database objects.
40.0 Demonstrate proficiency altering tables and constraints implementing views.
41.0 Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects.
42.0 Demonstrate ability to control user access and SQL language interface and reporting tool.
43.0 Demonstrate comprehension of bundling features of SQL.
44.0 Demonstrate comprehension working with composite data types by writing executable script files.
45.0 Describe the differences between SQL and PL/SQL.
46.0 Create SQL blocks.
47.0 Use variables in PL/SQL.
48.0 Recognize lexical units.
49.0 Recognize data types.
50.0 Use scalar data types.
51.0 Use various types of joins.
52.0 Use SQL group functions and subqueries.
53.0 Write SQL executable statements.
54.0 Use nested blocks and variable scope.
55.0 Use good programming practices.
56.0 Write DML statements to manipulate data.
57.0 Retrieve data using SQL.
58.0 Manipulate data using SQL.
59.0 Use transaction control statements.
60.0 Use IF conditional control statements.
61.0 Use CASE conditional control statements.
62.0 Use basic loop iterative control statements.
63.0 Use WHILE and FOR loop iterative control statements.
64.0 Use nested loop iterative control statements.
65.0 Use explicit cursors.
66.0 Use explicit cursor attributes.
67.0 Use cursor for loops.
68.0 Use cursors with parameters.
69.0 Use cursors for update transactions.

70.0 Use multiple cursors.
71.0 Handle exceptions.
72.0 Trap database server exceptions.
73.0 Trap user-defined exceptions.
74.0 Create procedures.
75.0 Use parameters in procedures.
76.0 Pass parameters.
77.0 Create stored functions.
78.0 Use functions in SQL statements.
79.0 Manage procedures and functions.
80.0 Manage object privileges.
81.0 Use invoker's rights.
82.0 Create packages.
83.0 Manage package constructs.
84.0 Use advanced package concepts.
85.0 Manage persistent state of package variables.
86.0 Use vendor-supplied packages.
87.0 Understand dynamic SQL.
88.0 Understand triggers.
89.0 Create DML triggers.
90.0 Create DDL and database event triggers.
91.0 Manage triggers.
92.0 Use large object data types.
93.0 Manage binary types.
94.0 Manage indexes.
95.0 Manage dependencies.
96.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
97.0 Solve problems using critical thinking skills, creativity and innovation.
98.0 Use information technology tools.
99.0 Describe the roles within teams, work units, departments, organizations, interorganizational systems, and the larger environment.
100.0 Describe the importance of professional ethics and legal responsibilities.
101.0 Understand network systems.
102.0 Program a database application.
103.0 Utilize the basic concepts of database design.
104.0 Utilize SQL and UNION queries.
105.0 Implement program statements using objects.
106.0 Utilize debugging tools and write error handlers.
107.0 Demonstrate file I/O.
108.0 Create forms and identify all the properties of a form.
109.0 Manipulate data using object models.

110.0 Develop custom controls.
111.0 Utilize API functions.
112.0 Demonstrate database replication and implement database replication using programming tools.
113.0 Analyze and implement security options.
114.0 Implement client/server applications.
115.0 Optimize the performance of a database.
116.0 Perform application distribution.
117.0 Test and debug databases.
118.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
119.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
120.0 Explain the importance of employability skill and entrepreneurship skills.
121.0 Responsible use of technology and information.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Database Fundamentals**
Course Number: **8206410**
Course Credit: **.5**

Course Description:

This data modeling course is designed to provide the foundation for future software engineers or database administrators. It transforms business requirements into an operational database utilizing a top-down systematic approach. Content includes creation of entity-relationship diagrams that accurately model an organization's needs and support the functions of a business, mapping of information needs into a relational database design, creation of physical relational database tables to implement database design, construction of a website that interacts with a database and generates report using web-based reports, and organization and composition of formal presentations, integrating multimedia software.

CTE Standards and Benchmarks	
10.0	Develop an awareness of the changes taking place in the information age and how they fit into an evolving society. The student will be able to:
10.01	Cite examples of jobs, salary, and opportunities he/she will have as a result of participating in the Academy.
10.02	Describe the role a database plays in a business and predict its evolution.
10.03	Demonstrate the difference between "data" and "information."
10.04	Understand the importance of clear communication when discussing business informational requirements.
10.05	Identify important historical contributions in database development and design.
11.0	Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs. The student will be able to:
11.01	Identify and analyze the phases of the database development process.
11.02	Explain what conceptual data modeling and database design involve.
11.03	Compare database development process with that of the application development process.
11.04	Distinguish between a conceptual model and a physical implementation.
12.0	Develop the process of creating an entity by identifying relationships. The student will be able to:
12.01	Identify and model various types of entities.
12.02	Identify naming and drawing conventions for entities.
12.03	Sequence the steps that are necessary for creation of an entity.

CTE Standards and Benchmarks	
	12.04 Analyze and model the relationships between entities.
13.0	Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to:
	13.01 Analyze and model attributes.
	13.02 Identify unique identifiers for each entity.
	13.03 Develop an entity relationship diagram tagging attributes with optionality.
14.0	Consider the degree and optionality of relationships of entities. The student will be able to:
	14.01 Create entity relationship models based on information requirements and interviews.
	14.02 Differentiate between one-to-many, many-to-many and one-to-one relationships.
	14.03 Identify relationship between two entities by reading a given diagram.
	14.04 Create a relationship between instances of the same entity.
	14.05 Read an entity relationship model in order to validate it.
15.0	Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to:
	15.01 Identify the significance of an attribute that has more than one value for each entity instance.
	15.02 Evaluate appropriate methods of storing validation rules for attributes.
	15.03 Recognize unique identifiers inherited from other entities.
	15.04 Sequence the steps involved in resolving a many-to-many relationship.
16.0	Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to:
	16.01 Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID).
	16.02 Resolve many-to-many relationships with intersection entities.
	16.03 Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships.
	16.04 Create exclusive entities and relationships by using subtypes and arcs, respectively.
	16.05 Identify initial layout for presentation and generate a list of action items for members of group.
	16.06 Develop an entity relationship model using subtypes, supertypes and an exclusive arc.
17.0	Demonstrate proficiency in designing and adding complexity to a logical relationship. The student will be able to:
	17.01 Revise an entity relationship model according to the diagramming techniques covered in this course.
	17.02 Define and give examples of hierarchical and recursive relationships.

CTE Standards and Benchmarks	
	17.03 Differentiate between transferable and non-transferable relationships.
	17.04 Deliver a professional, formal business style presentation.
	17.05 Evaluate and critique presentation layout, design and performance.
	17.06 Construct a model using both recursion and hierarchies to express the same conceptual meaning.
	17.07 Distinguish between using date as an attribute and DAY as an entity.
18.0	Apply complex logical information by fine-tuning entities and the process for relating them. The student will be able to:
	18.01 Describe a relational database and how it differs from other database systems.
	18.02 Define primary keys and foreign keys and describe their purpose.
	18.03 Describe what data integrity refers to and list some constraints.
	18.04 Explain how database design fits into the database development process.
	18.05 Translate an entity-relationship model into a relational database design.
19.0	Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to:
	19.01 Demonstrate ability to implement steps for mapping entity relationship models.
	19.02 Document an initial database design on table instance charts.
	19.03 Recognize raw data and evaluate the steps for creating a data group in unnormalized form.
20.0	Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion or mistakes. The student will be able to:
	20.01 Differentiate between normalized and unnormalized data.
	20.02 Move data from an unnormalized form through to a third normal form.
	20.03 Demonstrate ability to test data groups for third normal form compliance.
	20.04 Identify optimized data groups from given groups of normalized data.
21.0	Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data. The student will be able to:
	21.01 Compare the normalization and logical techniques in terms of strengths and weaknesses.
	21.02 Further define normalization and explain its benefits.
	21.03 Place tables in third normal form.
	21.04 Explain how conceptual data modeling rules ensure normalized tables.

CTE Standards and Benchmarks	
	21.05 Specify referential integrity constraints and design indexes.
22.0	Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database. The student will be able to:
	22.01 Evaluate the transformation of business requirements into an initial layout and design for a database.
	22.02 Construct simple webpage design for personal work folder.
	22.03 Evaluate existing websites and determine quality of design.
23.0	Extend the logical presentation model by normalizing the data and mapping the management system. The student will be able to:
	23.01 Formulate a plan of action for the Database Project using skills previously learned in this course.
	23.02 Normalize a logical to the third normal form (3NF).
	23.03 Create a table in the database using a database authoring tool.
	23.04 Demonstrate ability to edit tables using a database authoring tool.
	23.05 Create forms that will display the table components created with a database authoring tool.
24.0	Apply techniques for building a storage management system by creating a website using templates and wizards. The student will be able to:
	24.01 Create a website that displays the database project home.
	24.02 Link a website to create a web-enabled interface to the industry database.
	24.03 Edit the forms created and specify appropriate field labels for data entry.
25.0	Demonstrate storage closet design and functionality by constructing a group business presentation. The student will be able to:
	25.01 Evaluate and generate criteria for a formal, business presentation.
	25.02 Construct a persuasive group presentation using the guidelines set forth in class.
26.0	Demonstrate comprehension of database modeling competency through group presentation. The student will be able to:
	26.01 Deliver a formal business presentation for the class that discusses an entity-relationship model and initial database design.
	26.02 Demonstrate the functionality of the database and the layout/design capabilities of a database authoring tool.
	26.03 Self-assess learning experience through the presentation and demonstration of their final database project.
	26.04 Prepare appropriate end user documentation.
27.0	Demonstrate language arts knowledge and skills. The student will be able to:
	27.01 Locate, comprehend and evaluate key elements of oral and written information.
	27.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.

CTE Standards and Benchmarks	
	27.03 Present information formally and informally for specific purposes and audiences.
28.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	28.01 Demonstrate knowledge of arithmetic operations.
	28.02 Analyze and apply data and measurements to solve problems and interpret documents.
	28.03 Construct charts/tables/graphs using functions and data.

Florida Department of Education
Student Performance Standards

Course Title: **Data and Control Functions**
Course Number: **8206420**
Course Credit: **.5**

Course Description:

This course introduces data-server technology. Structured Query Language (SQL) is the standardized language that creates a medium for companies to compete in the building of databases or data management systems. Content of this course includes creation and maintenance of database objects and storage, retrieval and manipulation of data using SQL and Programming Language (PL) SQL programming languages. At the completion of Database Fundamentals and Data Control and Functions, students will be able to create blocks of application code that can be shared by multiple forms, reports and data management

CTE Standards and Benchmarks	
29.0	Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints. The student will be able to:
29.01	Identify the structural elements of a relational database table.
29.02	List and describe the system development life cycle.
29.03	Describe the industry implementation of the relational database management system (RDBMS) and object relational database management system (ORDBMS).
29.04	Explain how SQL and languages that extend SQL are used in the industry product set.
29.05	Identify the advantages of a database management system.
30.0	Demonstrate comprehension of aspects of SQL language interface by writing basic SQL statements. The student will be able to:
30.01	List the capabilities of SQL SELECT statements.
30.02	Execute a basic select statement.
30.03	Differentiate between SQL statements and language commands that extend SQL.
31.0	Demonstrate proficiency working with columns, characters, and rows in SQL. The student will be able to:
31.01	Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
31.02	Use column aliases to rename columns in the query result.
31.03	Eliminate duplicate rows in the query result.
31.04	Display the structure of a table.

CTE Standards and Benchmarks	
	31.05 Apply SQL syntax to restrict the rows returned from a query.
	31.06 Demonstrate application of the WHERE clause syntax.
	31.07 Construct and produce output using a SQL query containing character strings and date values.
32.0	Demonstrate proficiency in using SQL comparison operators. The student will be able to:
	32.01 Apply the proper comparison operator to return a desired result.
	32.02 Demonstrate proper use of BETWEEN, IN, and LIKE conditions to return a desired result.
	32.03 Distinguish between zero and the value of NULL as unavailable, unassigned, unknown, or inapplicable.
	32.04 Explain the use of comparison conditions and NULL.
33.0	Demonstrate proficiency in using logical comparisons and precedence rules. The student will be able to:
	33.01 Evaluate logical comparisons to restrict the rows returned based on two or more conditions.
	33.02 Apply the rules of precedence to determine the order in which expressions are evaluated and calculated.
	33.03 Construct a query to order a results set for single or multiple columns.
	33.04 Construct a query to sort a results set in ascending or descending order.
34.0	Demonstrate proficiency using SQL single row functions. The student will be able to:
	34.01 Perform calculations on data.
	34.02 Modify individual data items.
	34.03 Use character, number and date functions in SELECT statements.
	34.04 Format data and numbers for display purposes.
	34.05 Convert column data types.
35.0	Demonstrate proficiency displaying data from multiple tables. The student will be able to:
	35.01 Construct select statements to access data from more than one table using equality and non-equality joins.
	35.02 Use outer joins through viewing data that generally does not meet a join condition.
	35.03 Join a table to itself.
36.0	Demonstrate proficiency aggregating data using GROUP functions. The student will be able to:
	36.01 Identify the available group functions and describe their use.
	36.02 Demonstrate the ability to group data through the use of the GROUP BY clause.

CTE Standards and Benchmarks	
	36.03 Demonstrate the ability to include or exclude grouped rows by using the HAVING clause.
37.0	Demonstrate proficiency utilizing subqueries. The student will be able to:
	37.01 Write a query with an embedded subquery.
	37.02 Evaluate and perform a multiple-column subquery.
	37.03 Describe and explain the behavior of subqueries when null values are retrieved.
	37.04 Create a subquery in a FROM clause.
38.0	Demonstrate proficiency producing readable output with SQL language interface, reporting tool, and data manipulation language. The student will be able to:
	38.01 Produce queries that require an input variable.
	38.02 Customize the SQL language interface and reporting environment using SET commands for control.
	38.03 Produce more readable output through the use of the column and break commands.
	38.04 Describe data manipulation language (DML) and describe various DML statements.
	38.05 Utilize data manipulation language (DML) through inserting, updating and deleting rows from a table.
	38.06 Control transactions using COMMIT and ROLLBACK statements.
39.0	Demonstrate proficiency creating and managing database objects. The student will be able to:
	39.01 Describe the main database objects.
	39.02 Create tables and alter their definitions.
	39.03 Describe the data types that can be used when specifying column definition.
40.0	Demonstrate proficiency altering tables and constraints implementing views. The student will be able to:
	40.01 Create, drop, rename and truncate tables using SQL.
	40.02 Identify and describe various constraints including not null, unique, primary key, foreign key, and check.
	40.03 Create and maintain constraints including adding, dropping, enabling, disabling, and cascading.
	40.04 Recognize views and explain how they are created, how they retrieve data and how they perform DML operations.
41.0	Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects. The student will be able to:
	41.01 Create views, retrieve data through a view, alter the definition of a view and drop a view.
	41.02 Categorize information by using Top-N queries to retrieve specified data.
	41.03 Identify the features of a sequence and display sequence values using a data dictionary view.

CTE Standards and Benchmarks	
	41.04 Identify the characteristics of a cached sequence.
	41.05 Modify and remove a sequence using a SQL statement.
	41.06 Identify the features of private and public synonyms.
	41.07 Identify characteristics of an index and describe different types.
	41.08 Create and remove an index using a SQL statement.
42.0	Demonstrate ability to control user access and SQL language interface and reporting tool. The student will be able to:
	42.01 Identify the features of database security.
	42.02 Create users using SQL statements.
	42.03 Grant and revoke object privileges using a SQL language interface and reporting tool.
43.0	Demonstrate comprehension of bundling features of SQL. The student will be able to:
	43.01 List and describe the benefits of extensions to SQL.
	43.02 Recognize the basic SQL block and its sections.
	43.03 Declare SQL variables and describe their significance.
	43.04 Execute a SQL block.
44.0	Demonstrate comprehension working with composite data types by writing executable script files. The student will be able to:
	44.01 Recognize the significance of the executable section and decide when to use it.
	44.02 Write statements in the executable section.
	44.03 Describe the rules of nested blocks.
	44.04 Identify and utilize appropriate coding conventions.
	44.05 Create a script that will insert, update, merge and delete data in a table.

Florida Department of Education
Student Performance Standards

Course Title: **Specialized Database Programming**
Course Number: **8206430**
Course Credit: **1**

Course Description:

This course covers PL/SQL, a procedural language extension to SQL. Through an innovative project-based approach, students learn procedural logic constructs such as variables, constants, conditional statements, and iterative controls. After completing this course, the student will have the opportunity to sit for the second of two exams required to earn the Oracle Certified Associate certification and the student will be able to:

CTE Standards and Benchmarks	
45.0	Describe the differences between SQL and PL/SQL. The student will be able to:
	45.01 Describe PL/SQL.
	45.02 Differentiate between SQL and PL/SQL.
	45.03 Explain the need for and benefits of PL/SQL.
46.0	Create SQL blocks. The student will be able to:
	46.01 Describe the structure of a SQL block.
	46.02 Identify the different types of SQL blocks.
	46.03 Identify SQL programming environments.
	46.04 Create and execute an anonymous block.
	46.05 Output messages in PL/SQL.
47.0	Use variables in PL/SQL. The student will be able to:
	47.01 Describe how variables are used in PL/SQL.
	47.02 Identify the syntax for using variables.
	47.03 Declare and initialize variables.
	47.04 Assign new values to variables.
48.0	Recognize lexical units. The student will be able to:
	48.01 Describe the types of lexical units in PL/SQL.

CTE Standards and Benchmarks	
	48.02 Describe identifiers and identify valid and invalid identifiers.
	48.03 Describe and identify reserved words, delimiters, literals, and comments.
49.0	Recognize data types. The student will be able to:
	49.01 Describe the data type categories.
	49.02 Give examples of scalar, composite, and large object (LOB) data types.
	49.03 Identify when an object becomes eligible for garbage collection.
50.0	Use scalar data types. The student will be able to:
	50.01 Declare and use scalar data types.
	50.02 Define guidelines for declaring and initializing variables.
	50.03 Describe the benefits of anchoring data types with the %TYPE attribute.
51.0	Use various types of joins. The student will be able to:
	51.01 Construct and execute SELECT statements using an equijoin.
	51.02 Construct and execute SELECT statements using a non-equijoin.
	51.03 Construct and execute SELECT statements using an outer join.
	51.04 Construct and execute SELECT statements that result in a cross join.
52.0	Use SQL group functions and subqueries. The student will be able to:
	52.01 Construct and execute an SQL query using group functions to determine a sum total, an average amount, and a maximum value.
	52.02 Construct and execute an SQL query that groups data based on specified criteria.
	52.03 Construct and execute an SQL query that contains a WHERE clause using a single-row subquery.
	52.04 Construct and execute an SQL query that contains a WHERE clause using a multiple-row subquery.
53.0	Write SQL executable statements. The student will be able to:
	53.01 Construct variable assignment statements.
	53.02 Construct statements using built-in SQL functions.
	53.03 Differentiate between implicit and explicit data type conversions.
	53.04 Describe when implicit data type conversions take place.
	53.05 List the drawbacks of implicit data type conversions.

CTE Standards and Benchmarks	
	53.06 Construct statements using functions to explicitly convert data types.
	53.07 Construct statements using operators.
54.0	Use nested blocks and variable scope. The student will be able to:
	54.01 Understand the scope and visibility of variables.
	54.02 Write nested blocks and qualify variables with labels.
	54.03 Describe the scope of an exception.
	54.04 Describe the effect of exception propagation in nested blocks.
55.0	Use good programming practices. The student will be able to:
	55.01 List examples of good programming practices.
	55.02 Insert comments into SQL code.
	55.03 Follow formatting guidelines when writing code.
56.0	Write DML statements to manipulate data. The student will be able to:
	56.01 Construct and execute a DML statement to insert data into a table.
	56.02 Construct and execute a DML statement to update data in a table.
	56.03 Construct and execute a DML statement to delete data from a table.
	56.04 Construct and execute a DML statement to merge data into a table.
57.0	Retrieve data using PL/SQL. The student will be able to:
	57.01 Identify SQL statements that can be directly included in an executable block.
	57.02 Construct and execute an INTO clause to hold values returned by a single-row SELECT statement.
	57.03 Construct statements that retrieve data.
58.0	Manipulate data using PL/SQL. The student will be able to:
	58.01 Construct and execute SQL statements that manipulate data with DML statements.
	58.02 Describe when to use implicit or explicit cursors.
	58.03 Create code to use SQL implicit cursor attributes to evaluate cursor activity.
59.0	Use transaction control statements. The student will be able to:
	59.01 Define a transaction and give an example.

CTE Standards and Benchmarks	
	59.02 Construct and execute a transaction control statement.
60.0	Use IF conditional control statements. The student will be able to:
	60.01 Construct and use an IF statement.
	60.02 Construct and use an IF -ELSIF statement.
	60.03 Create SQL to handle null conditions in an IF statement.
61.0	Use CASE conditional control statements. The student will be able to:
	61.01 Construct and use CASE statements.
	61.02 Construct and use CASE expressions.
	61.03 Include syntax to handle null conditions in a CASE statement.
	61.04 Include syntax to handle Boolean conditions in IF and CASE statements.
62.0	Use basic LOOP iterative control statements. The student will be able to:
	62.01 Describe the types of LOOP statements and their uses.
	62.02 Create SQL containing a basic loop and an EXIT statement.
	62.03 Create SQL containing a basic loop and an EXIT statement with conditional termination.
63.0	Use WHILE and FOR loop iterative control statements. The student will be able to:
	63.01 Construct and use the WHILE looping construct.
	63.02 Construct and use the FOR looping construct.
	63.03 Describe when a WHILE loop is used.
	63.04 Describe when a FOR loop is used.
64.0	Use nested loop iterative control statements. The student will be able to:
	64.01 Construct and execute SQL using nested loops.
	64.02 Evaluate a nested loop construct and identify the exit point.
65.0	Use explicit cursors. The student will be able to:
	65.01 List the guidelines for declaring and controlling explicit cursors.
	65.02 Create SQL code to open a cursor and fetch a piece of data into a variable.
	65.03 Use a simple loop to fetch multiple rows from a cursor.

CTE Standards and Benchmarks	
	65.04 Create SQL code to close a cursor.
66.0	Use explicit cursor attributes. The student will be able to:
	66.01 Define a record structure.
	66.02 Create SQL code to process the row of an active set using record types in cursors.
	66.03 Use cursor attributes to retrieve information about the state of an explicit cursor.
67.0	Use cursor FOR loops. The student will be able to:
	67.01 List and explain the benefits of using cursor FOR loops.
	67.02 Create SQL code to declare a cursor and manipulate it in a FOR loop.
	67.03 Create SQL code containing a cursor FOR loop using a subquery.
68.0	Use cursors with parameters. The student will be able to:
	68.01 List the benefits of using parameters with cursors.
	68.02 Create SQL code to declare and manipulate a cursor with a parameter.
69.0	Use cursors for UPDATE transactions. The student will be able to:
	69.01 Create SQL code to lock rows before an update using the appropriate clause.
	69.02 Explain the effect of using NOWAIT in an update cursor declaration.
	69.03 Create SQL code to use the current row of the cursor in an UPDATE or DELETE statement.
70.0	Use multiple cursors. The student will be able to:
	70.01 Explain the need for using multiple cursors to produce multilevel reports.
	70.02 Create SQL code to declare and manipulate multiple cursors within nested loops.
	70.03 Create SQL code to declare and manipulate multiple cursors using parameters.
71.0	Handle exceptions. The student will be able to:
	71.01 Describe the advantages of including exception handling code.
	71.02 Describe the purpose of an EXCEPTION section in a SQL block.
	71.03 Create SQL code to include an EXCEPTION section.
	71.04 List the guidelines for exception handling.
72.0	Trap database server exceptions. The student will be able to:

CTE Standards and Benchmarks	
	72.01 Distinguish between errors defined by the server and those defined by the programmer.
	72.02 Differentiate between errors that are handled implicitly and explicitly by the database server.
	72.03 Write SQL code to trap a predefined database server error.
	72.04 Write SQL code to trap a non-predefined database server error.
	72.05 Write SQL code to identify an exception by error code and by error message.
73.0	Trap user-defined exceptions. The student will be able to:
	73.01 Write SQL code to name a user-defined exception.
	73.02 Write SQL code to raise an exception.
	73.03 Write SQL code to handle a raised exception.
	73.04 Write SQL code to use RAISE_APPLICATION_ERROR.
74.0	Create procedures. The student will be able to:
	74.01 Differentiate between anonymous blocks and subprograms.
	74.02 Identify the benefits of using subprograms.
	74.03 Describe a stored procedure.
	74.04 Create a procedure.
	74.05 Describe how a stored procedure is invoked.
75.0	Use parameters in procedures. The student will be able to:
	75.01 Describe how parameters contribute to a procedure.
	75.02 Define a parameter.
	75.03 Create a procedure using a parameter.
	75.04 Invoke a procedure that has parameters.
	75.05 Distinguish between formal and actual parameters.
76.0	Pass parameters. The student will be able to:
	76.01 List the types of parameter modes.
	76.02 Create a procedure that passes parameters.
	76.03 Identify three methods for passing parameters.

CTE Standards and Benchmarks	
	76.04 Describe the DEFAULT option for parameters.
77.0	Create stored functions. The student will be able to:
	77.01 Describe the difference between a stored procedure and a stored function.
	77.02 Create a SQL block containing a function.
	77.03 Identify ways in which functions may be invoked.
	77.04 Create a SQL block that invokes a function that has parameters.
78.0	Use functions in SQL statements. The student will be able to:
	78.01 Describe where user-defined functions can be called from within an SQL statement.
	78.02 Describe the restrictions on calling functions from SQL statements.
	78.03 Describe the purpose of the Data Dictionary.
	78.04 Differentiate between the three types of Data Dictionary views.
	78.05 Write SQL SELECT statements to retrieve information from the Data Dictionary.
	78.06 Explain the use of DICTIONARY as a Data Dictionary search engine.
79.0	Manage procedures and functions. The student will be able to:
	79.01 Describe how exceptions are propagated.
	79.02 Remove a function and a procedure.
	79.03 Use Data Dictionary views to identify and manage stored procedures.
80.0	Manage object privileges. The student will be able to:
	80.01 List and explain several object privileges.
	80.02 Explain the function of the EXECUTE object privilege.
	80.03 Write SQL statements to grant and revoke object privileges.
81.0	Use invoker’s rights. The student will be able to:
	81.01 Contrast invoker’s rights with definer’s rights.
	81.02 Create a procedure that uses invoker’s rights.
82.0	Create packages. The student will be able to:
	82.01 Describe a package, its components, and the reasons for use.

CTE Standards and Benchmarks	
	82.02 Create packages containing related variables, cursors, constants, exceptions, procedures, and functions.
	82.03 Create a SQL block that invokes a package construct.
83.0	Manage package constructs. The student will be able to:
	83.01 Explain the difference between public and private package constructs.
	83.02 Designate a package construct as either public or private.
	83.03 Specify the syntax to drop a package.
	83.04 Identify Data Dictionary views used to manage packages.
	83.05 Identify the guidelines for using packages.
84.0	Use advanced package concepts. The student will be able to:
	84.01 Write packages that use the overloading feature.
	84.02 Write packages that use forward declarations.
	84.03 Explain the purpose of a package initialization block.
	84.04 Identify restrictions on using packaged functions in SQL statements.
85.0	Manage persistent state of package variables. The student will be able to:
	85.01 Identify persistent states of package variables.
	85.02 Control the persistent state of a package cursor.
86.0	Use vendor-supplied packages. The student will be able to:
	86.01 Describe common uses for the vendor-supplied package.
	86.02 Use the syntax to specify messages for the vendor-supplied package.
	86.03 Describe the purpose for the vendor-supplied package.
	86.04 Identify the exceptions used in conjunction with the vendor-supplied package.
87.0	Understand dynamic SQL. The student will be able to:
	87.01 Identify the stages through which all SQL statements pass.
	87.02 Describe the reasons for using dynamic SQL to create an SQL statement.
	87.03 List four SQL statements supporting Native Dynamic SQL.
	87.04 Describe the benefits of Execute Immediate over Dynamic SQL.

CTE Standards and Benchmarks	
88.0	Understand triggers. The student will be able to:
88.01	Describe database triggers and their uses.
88.02	Differentiate between a database trigger and an application trigger.
88.03	List the guidelines for using triggers.
88.04	Compare and contrast database triggers and stored procedures.
89.0	Create DML triggers. The student will be able to:
89.01	Create a DML trigger and identify its components.
89.02	Create a statement level trigger.
89.03	Describe the trigger firing sequence options.
89.04	Create a DML trigger that uses conditional predicates.
89.05	Create a row level trigger.
89.06	Create a row level trigger that uses OLD and NEW qualifiers.
89.07	Create an INSTEAD OF trigger.
90.0	Create DDL and database event triggers. The student will be able to:
90.01	Describe the events that cause DDL and database event triggers to fire.
90.02	Create a trigger for a DDL statement.
90.03	Create a trigger for a database event.
90.04	Describe the functionality of the CALL statement.
90.05	Describe the cause of a mutating table.
91.0	Manage triggers. The student will be able to:
91.01	View trigger information in the Data Dictionary.
91.02	Disable and enable a database trigger.
91.03	Remove a trigger from the database.
92.0	Use large object data types. The student will be able to:
92.01	Compare and contrast LONG and LOB data types.
92.02	Describe LOB data types and how they are used.

CTE Standards and Benchmarks	
	92.03 Differentiate between internal and external LOBs.
	92.04 Create and maintain LOB data types.
	92.05 Migrate data from LONG to LOB.
93.0	Manage binary types. The student will be able to:
	93.01 Define binary types and the binary types column data type.
	93.02 Create directory objects and view them in the Data Dictionary.
	93.03 Manage and manipulate binary types.
94.0	Manage indexes. The student will be able to:
	94.01 Create and manipulate user-defined SQL records.
	94.02 Create an INDEX.
	94.03 Describe the difference between records, tables, and tables of records.
95.0	Manage dependencies. The student will be able to:
	95.01 Describe the implications of procedural dependencies.
	95.02 Contrast dependent objects and referenced objects.
	95.03 View dependency information in the Data Dictionary.
	95.04 Use a script to create the objects required to display dependencies.
	95.05 Use views to display dependencies.
	95.06 Describe when automatic recompilation occurs.
	95.07 Describe how to minimize dependency failures.
96.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	96.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	96.02 Locate, organize and reference written information from various sources.
	96.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	96.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	96.05 Apply active listening skills to obtain and clarify information.
	96.06 Develop and interpret tables and charts to support written and oral communications.

CTE Standards and Benchmarks	
	96.07 Exhibit public relations skills that aid in achieving customer satisfaction.
	96.08 Evaluate program designs and implementations written by others for readability and usability.
97.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	97.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	97.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	97.03 Identify and document workplace performance goals and monitor progress toward those goals.
	97.04 Conduct technical research to gather information necessary for decision-making.
98.0	Use information technology tools. The student will be able to:
	98.01 Use personal information management (PIM) applications to increase workplace efficiency.
	98.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	98.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	98.04 Employ collaborative/groupware applications to facilitate group work.
99.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	99.01 Describe the nature and types of business organizations.
	99.02 Explain the effect of key organizational systems on performance and quality.
	99.03 List and describe quality control systems and/or practices common to the workplace.
	99.04 Explain the impact of the global economy on business organizations.
100.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	100.01 Evaluate and justify decisions based on ethical reasoning.
	100.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	100.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	100.04 Interpret and explain written organizational policies and procedures.
101.0	Understand network systems. The student will be able to:
	101.01 Identify and select the most appropriate file format based on trade-offs (e.g., open file formats, text, proprietary and binary formats, compression and encryption formats).
	101.02 Describe the issues that impact network functionality (e.g., latency, bandwidth, firewalls and server capability).

CTE Standards and Benchmarks
101.03 Describe common network protocols, such as IP, TCP, SMTP, HTTP, and FTP, and how these are applied by client-server and peer-to-peer networks.

Florida Department of Education
Student Performance Standards

Course Title: **Specialized Database Applications**
Course Number: **8206440**
Course Credit: **1**

Course Description:

This is the final course in the Database and Programming Essentials program and is designed to teach specialized database operations and utilization of SQL language for database administration and maintenance.

CTE Standards and Benchmarks
102.0 Program a database application. The student will be able to:
102.01 Utilize loop statements.
102.02 Given a scenario, use arithmetic, comparison, and pattern-matching operators.
102.03 Create user-defined functions.
102.04 Utilize common built-in functions.
102.05 Declare variables in modules and procedures.
102.06 Declare arrays, and initialize elements of arrays.
102.07 Declare and use object variables and collections, and use their associated properties and methods.
102.08 Declare symbolic constants, and make them available locally or publicly.
102.09 Respond to events.
103.0 Utilize the basic concepts of database design. The student will be able to:
103.01 Apply basic concepts of normalization.
103.02 Utilize the cascade update and cascade delete options.
104.0 Utilize SQL and UNION queries. The student will be able to:
104.01 Utilize SQL to write common queries.
104.02 Refer to objects by using SQL.
104.03 Utilize union queries.
105.0 Implement program statements using objects. The student will be able to:

CTE Standards and Benchmarks	
	105.01 Determine when to use data access objects.
	105.02 Differentiate between objects and collections.
	105.03 Write statements that access and modify database objects.
	105.04 Utilize data access objects.
	105.05 Select appropriate methods and property settings for use with specified objects.
106.0	Utilize debugging tools and write error handlers. The student will be able to:
	106.01 Trap errors.
	106.02 Utilize debugging tools to suspend program execution, and to examine, step through, and reset execution of code.
	106.03 Debug code samples.
	106.04 Utilize the Debugger to monitor variable values.
	106.05 Write an error handler.
107.0	Demonstrate file I/O. The student will be able to:
	107.01 Read from files.
	107.02 Write to files.
	107.03 Utilize record locking.
108.0	Create forms and identify all the properties of a form. The student will be able to:
	108.01 Choose form-specific and report-specific properties to set.
	108.02 Choose control properties to set.
	108.03 Assign event-handling procedures to controls in a form.
	108.04 Define and create form and report modules.
	108.05 Identify the scope of a form or report module.
	108.06 Open multiple instances of a form, and refer to them.
	108.07 Assign values to form properties.
	108.08 Use form methods.
109.0	Manipulate data using object models. The student will be able to:
	109.01 Connect to a data source.

CTE Standards and Benchmarks	
	109.02 Open a recordset.
	109.03 Insert, update, delete and find data.
110.0	Develop custom controls. The student will be able to:
	110.01 Set properties for custom controls.
	110.02 Customize user interface controls.
111.0	Utilize API functions. The student will be able to:
	111.01 Properly declare functions.
	111.02 Use the by value and by reference parameters.
112.0	Demonstrate database replication and implement database replication using programming tools. The student will be able to:
	112.01 Make a database replicable.
	112.02 View a synchronization schedule.
	112.03 Explain the purpose of the Replication ID.
	112.04 Explain how synchronization conflicts are resolved.
	112.05 Identify the advantages of using replication of synchronization.
	112.06 Identify the changes that the database engine makes when it converts a nonreplicable database into replicable database.
113.0	Analyze and implement security options. The student will be able to:
	113.01 Analyze a scenario, and recommend an appropriate type of security.
	113.02 Explain the steps for implementing security.
	113.03 Analyze code to ensure that it sets security options.
	113.04 Write code to implement security options.
114.0	Implement client/server applications. The student will be able to:
	114.01 Demonstrate SQL pass through queries and application queries.
	114.02 Access external data.
	114.03 Trap errors that are generated by the server.
	114.04 Optimize connections.
	114.05 Optimize performance for a given client/server application.

CTE Standards and Benchmarks	
115.0	Optimize the performance of a database. The student will be able to:
115.01	Differentiate between single-field and multiple-field indexes.
115.02	Optimize queries.
115.03	Restructure queries to allow faster execution.
115.04	Optimize performance in distributed applications.
115.05	Optimize performance for client/server applications.
116.0	Perform application distribution. The student will be able to:
116.01	Prepare an application for distribution.
116.02	Analyze various methods to distribute a client/server application.
116.03	Distribute custom controls with an application.
116.04	Provide online help.
117.0	Test and debug databases. The student will be able to:
117.01	Implement error handling.
117.02	Test and debug library databases.
118.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
118.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
118.02	Explain emergency procedures to follow in response to workplace accidents.
118.03	Create a disaster and/or emergency response plan.
119.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
119.01	Employ leadership skills to accomplish organizational goals and objectives.
119.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
119.03	Conduct and participate in meetings to accomplish work tasks.
119.04	Employ mentoring skills to inspire and teach others.
120.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
120.01	Identify and demonstrate positive work behaviors needed to be employable.
120.02	Develop personal career plan that includes goals, objectives, and strategies.

CTE Standards and Benchmarks	
	120.03 Examine licensing, certification, and industry credentialing requirements.
	120.04 Maintain a career portfolio to document knowledge, skills, and experience.
	120.05 Evaluate and compare employment opportunities that match career goals.
	120.06 Identify and exhibit traits for retaining employment.
	120.07 Identify opportunities and research requirements for career advancement.
	120.08 Research the benefits of ongoing professional development.
	120.09 Examine and describe entrepreneurship opportunities as a career planning option.
121.0	Responsible use of technology and information. The student will be able to:
	121.01 Compare and contrast appropriate and inappropriate social networking behaviors.
	121.02 Describe and demonstrate ethical and responsible use of modern communication media and devices.
	121.03 Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Business Computer Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8206500
CIP Number	0511020202
Grade Level	9-12
Program Length	8 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in computer programming positions.

The content includes but is not limited to converting problems into detailed plans; writing code into computer language; testing, monitoring, debugging, documenting, and maintaining computer programs; and designing programs for specific uses and machines.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of eight (8) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
8206010	Business Computer Programming 1	BUS ED 1 @2 VOE @7 TC COOP ED @7 BUS DP @7 %G TEC ELEC $7 G ELECT DP @7 %G BOOKKEEPIN @4 @7 G COMPU SCI 6	1 credit		2	CT
8206020	Business Computer Programming 2		1 credit		2	CT
8206030	Business Computer Programming 3		1 credit		2	CT
8206040	Business Computer Programming 4		1 credit		2	CT
8206050	Business Computer Programming 5		1 credit		3	CT
8206060	Business Computer Programming 6		1 credit		3	CT
8206070	Business Computer Programming 7		1 credit		3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Assess personal strengths and weaknesses as they relate to job objectives, career exploration, personal develop, and life goals.
11.0 Participate in work-based learning experiences.
12.0 Identify functions of information processing.
13.0 Identify functions of computers.
14.0 Test programs.
15.0 Plan program design.
16.0 Code programs.
17.0 Perform program maintenance.
18.0 Create and maintain documentation.
19.0 Develop an understanding of basic financial business concepts.
20.0 Demonstrate an understanding of operating systems, environments, and platforms.
21.0 Develop an awareness of software quality assurance.
22.0 Implement enhanced program structures.
23.0 Develop an understanding of programming techniques and concepts.
24.0 Demonstrate mathematics knowledge and skills.
25.0 Participate in work-based learning experiences.
26.0 Identify functions of information processing.
27.0 Identify functions of computers.
28.0 Test programs.
29.0 Plan program design.
30.0 Code programs.
31.0 Perform program maintenance.
32.0 Create and maintain documentation.

33.0 Evaluate assigned business computer programming tasks.
34.0 Understand the integrated nature of corporate systems.
35.0 Demonstrate an understanding of operating systems, environments, and platforms.
36.0 Implement enhanced program structures.
37.0 Develop an understanding of programming techniques and concepts.
38.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
39.0 Solve problems using critical thinking skills, creativity and innovation.
40.0 Use information technology tools.
41.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
42.0 Describe the importance of professional ethics and legal responsibilities.
43.0 Participate in work-based learning experiences.
44.0 Identify functions of information processing.
45.0 Identify functions of computers.
46.0 Test programs.
47.0 Plan program design.
48.0 Evaluate assigned business computer programming tasks.
49.0 Develop an awareness of software quality assurance.
50.0 Implement enhanced program structures.
51.0 Develop an understanding of programming techniques and concepts.
52.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
53.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
54.0 Explain the importance of employability skill and entrepreneurship skills.
55.0 Participate in work-based learning experiences.
56.0 Identify functions of information processing.
57.0 Code programs.
58.0 Perform program maintenance.
59.0 Evaluate assigned business computer programming tasks.
60.0 Implement enhanced program structures.
61.0 Test programs.
62.0 Plan program design.
63.0 Code programs.
64.0 Perform program maintenance.
65.0 Create and maintain documentation.
66.0 Evaluate assigned business computer programming tasks.
67.0 Implement enhanced program structures.
68.0 Test program.
69.0 Perform program maintenance.
70.0 Evaluate assigned business computer programming tasks.
71.0 Demonstrate an understanding of operating systems, environments, and platforms.

72.0 Develop an awareness of software quality assurance.
73.0 Implement enhanced program structures.
74.0 Develop an understanding of programming techniques and concepts.
75.0 Test programs.
76.0 Plan program design.
77.0 Code programs.
78.0 Perform program maintenance.
79.0 Implement enhanced program structures.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 1**
Course Number: **8206010**
Course Credit: **1**

Course Description:

This course introduces computer programming concepts for business applications. The content includes basic information processing and computer functions; operating systems, environments, and hardware platforms; programming techniques and concepts; and basic financial business concepts.

CTE Standards and Benchmarks	
10.0	Assess personal strengths and weaknesses as they relate to job objectives, career exploration, personal development, and life goals. The student will be able to:
10.01	Investigate specific job opportunities in computer programming in the local job market.
10.02	Identify tasks performed by computer programming personnel.
10.03	Identify alternative career paths for computer programmers.
10.04	Investigate the need for additional training for computer programmers.
11.0	Participate in work-based learning experiences. The student will be able to:
11.01	Participate in work-based learning experiences in a computer programming environment.
11.02	Discuss the use of technology in a computer programming environment.
12.0	Identify functions of information processing. The student will be able to:
12.01	Identify characteristics of high-level languages.
12.02	Identify characteristics of operating systems.
12.03	Identify characteristics of sequential, indexed-sequential, random, and direct files.
12.04	Identify characteristics of a network.
12.05	Identify needs for software development in business.
12.06	Distinguish among integer, fixed-point, and floating-point calculations.
13.0	Identify functions of computers. The student will be able to:
13.01	Identify computer hardware and software.

CTE Standards and Benchmarks	
	13.02 Identify generic data processing terminology.
	13.03 Sequence and define the steps in the input, processing, output, and storage cycle.
14.0	Test programs. The student will be able to:
	14.01 Develop a plan for testing programs.
	14.02 Develop data for use in program testing.
	14.03 Perform debugging activities.
	14.04 Distinguish among the different types of program and design errors.
	14.05 Evaluate program test results.
	14.06 Execute programs and subroutines as they relate to the total application.
	14.07 Compile and run programs.
15.0	Plan program design. The student will be able to:
	15.01 Formulate a plan to determine program specifications individually and in groups.
	15.02 Use a graphical representation or pseudocode to represent the structure in a program or subroutine.
	15.03 Design programs to solve problems using problem-solving strategies.
	15.04 Prepare proper input/output layout specifications.
	15.05 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
16.0	Code programs. The student will be able to:
	16.01 Utilize reference manuals.
	16.02 Write programs according to the recognized programming standards.
	16.03 Write internal documentation statements as needed in the program source code.
	16.04 Code programs in high-level languages for business applications.
	16.05 Code programs using logical statement (e.g., If-Then-Else, Do...While).
	16.06 Enter and modify source code using a program language editor.
	16.07 Code routines within programs that validate input data.
	16.08 Use the rounding function in calculations within programs.
17.0	Perform program maintenance. The student will be able to:

CTE Standards and Benchmarks	
	17.01 Analyze output to identify and annotate errors or enhancements.
18.0	Create and maintain documentation. The student will be able to:
	18.01 Follow established documentation standards.
19.0	Develop an understanding of basic financial business concepts. The student will be able to:
	19.01 Identify generic accounting terminology as it relates to information systems.
	19.02 Identify ways in which transactions interact with various business systems.
20.0	Demonstrate an understanding of operating systems, environments, and platforms. The student will be able to:
	20.01 Identify various types of operating systems/environments for different computer hardware platforms.
	20.02 Distinguish between different types of computer hardware platforms.
21.0	Develop an awareness of software quality assurance. The student will be able to:
	21.01 Identify the legal and social consequences of errors in software.
	21.02 Describe copyright and other laws that relate to software theft and misuse.
	21.03 Describe software security measures to protect computer systems and data from unauthorized use and tampering (e.g., physical security, passwords, virus protection/prevention).
22.0	Implement enhanced program structures. The student will be able to:
	22.01 Write programs that incorporate multi-level subtotals and page breaks.
	22.02 Write programs that include tables or arrays or routines for data entry and lookup.
	22.03 Write programs that use iteration.
23.0	Develop an understanding of programming techniques and concepts. The student will be able to:
	23.01 Identify the basic constructs used in structured programming.
	23.02 Distinguish between top-down and bottom-up design.
	23.03 Distinguish between interpreters and compilers.
24.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	24.01 Demonstrate knowledge of arithmetic operations.
	24.02 Analyze and apply data and measurements to solve problems and interpret documents.
	24.03 Construct charts/tables/graphs using functions and data.

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 2**
Course Number: **8206020**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts for business applications. The content includes information processing and computer functions; operating systems; programming techniques and concepts for sequential, indexed sequential, random, and direct files; and the integrated nature of corporate systems.

CTE Standards and Benchmarks	
25.0	Participate in work-based learning experiences. The student will be able to:
25.01	Participate in work-based learning experiences in a computer programming environment.
25.02	Discuss the use of technology in a computer programming environment.
25.03	Compare and contrast programming languages used in a computer programming environment.
26.0	Identify functions of information processing. The student will be able to:
26.01	Identify causes of software development problems in business.
26.02	Identify most appropriate languages for solving business problems.
26.03	Describe the difference between a database management system and a file management system.
26.04	Manipulate data between numbering systems.
26.05	Identify how numeric and non-numeric data are represented in memory.
27.0	Identify functions of computers. The student will be able to:
27.01	Identify advanced data processing terminology.
27.02	Identify examples of emerging hardware technology.
27.03	Illustrate various configurations of hardware components.
28.0	Test programs. The student will be able to:
28.01	Use trace routines of compilers to assist in program debugging.
29.0	Plan program design. The student will be able to:

CTE Standards and Benchmarks	
	29.01 Examine existing utility programs and subroutines for use with other programs.
30.0	Code programs. The student will be able to:
	30.01 Write code that accesses sequential, indexed sequential, random, and direct files.
31.0	Perform program maintenance. The student will be able to:
	31.01 Review requested modification of programs and establish a plan of action.
	31.02 Design needed modifications in conformance with established standards.
	31.03 Code, test, and debug modifications prior to updating production code.
	31.04 Update production programs and documentation with changes.
32.0	Create and maintain documentation. The student will be able to:
	32.01 Write documentation to assist operators and end-users.
	32.02 Update existing documentation to reflect program changes.
33.0	Evaluate assigned business computer programming tasks. The student will be able to:
	33.01 Estimate the time necessary to write a program.
34.0	Understand the integrated nature of corporate systems. The student will be able to:
	34.01 Analyze the flow of information throughout the various departments in a business.
	34.02 Explain how programs written for one department affect other departments in the business.
35.0	Demonstrate an understanding of operating systems, environments, and platforms. The student will be able to:
	35.01 Assess and analyze the functions of different operating systems.
36.0	Implement enhanced program structures. The student will be able to:
	36.01 Write routines to sort arrays.
	36.02 Write programs that sort records in files.
	36.03 Write programs to create and maintain a master file.
	36.04 Write programs to process transactions.
	36.05 Write programs that read and write sequential files.
	36.06 Write programs that read and write indexed-sequential files.
	36.07 Write programs that read and write random files.

CTE Standards and Benchmarks	
37.0	Develop an understanding of programming techniques and concepts. The student will be able to:
37.01	Distinguish between iteration and recursion.
37.02	Evaluate Boolean expressions.
38.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
38.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
38.02	Locate, organize and reference written information from various sources.
38.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
38.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.
38.05	Apply active listening skills to obtain and clarify information.
38.06	Develop and interpret tables and charts to support written and oral communications.
38.07	Exhibit public relations skills that aid in achieving customer satisfaction.
39.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
39.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
39.02	Employ critical thinking and interpersonal skills to resolve conflicts.
39.03	Identify and document workplace performance goals and monitor progress toward those goals.
39.04	Conduct technical research to gather information necessary for decision-making.
40.0	Use information technology tools. The student will be able to:
40.01	Use personal information management (PIM) applications to increase workplace efficiency.
40.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
40.03	Employ computer operations applications to access, create, manage, integrate, and store information.
40.04	Employ collaborative/groupware applications to facilitate group work.
41.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
41.01	Describe the nature and types of business organizations.
41.02	Explain the effect of key organizational systems on performance and quality.
41.03	List and describe quality control systems and/or practices common to the workplace.
41.04	Explain the impact of the global economy on business organizations.

CTE Standards and Benchmarks	
42.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
42.01	Evaluate and justify decisions based on ethical reasoning.
42.02	Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
42.03	Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
42.04	Interpret and explain written organizational policies and procedures.

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 3**
Course Number: **8206030**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts for business applications. The content includes interfaces for systems integration, software quality assurance, and advanced programming techniques and concepts.

CTE Standards and Benchmarks	
43.0	Participate in work-based learning experiences. The student will be able to:
43.01	Participate in work-based learning experiences in a computer programming environment.
43.02	Compare and contrast programming languages used in a computer programming environment.
44.0	Identify functions of information processing. The student will be able to:
44.01	Choose appropriate storage of numeric values to insure precision needed for calculations (e.g., integer, fixed-point, floating-point).
45.0	Identify functions of computers. The student will be able to:
45.01	Identify the advantages and disadvantages of virtual memory.
46.0	Test programs. The student will be able to:
46.01	Develop a plan for system integration testing.
47.0	Plan program design. The student will be able to:
47.01	Plan interface for systems integration.
48.0	Evaluate assigned business computer programming tasks. The student will be able to:
48.01	Analyze computer resources necessary to run a program.
49.0	Develop an awareness of software quality assurance. The student will be able to:
49.01	Evaluate performance, functionality, and validity of various software packages.
50.0	Implement enhanced program structures. The student will be able to:
50.01	Write programs to import/export data from external sources.
51.0	Develop an understanding of programming techniques and concepts. The student will be able to:

CTE Standards and Benchmarks	
	51.01 Identify object-oriented concepts and provide examples of objects in an object-oriented language.
	51.02 Describe development methodologies, programming and system languages, database technologies, and data communication.
52.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	52.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	52.02 Explain emergency procedures to follow in response to workplace accidents.
	52.03 Create a disaster and/or emergency response plan.
53.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	53.01 Employ leadership skills to accomplish organizational goals and objectives.
	53.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	53.03 Conduct and participate in meetings to accomplish work tasks.
	53.04 Employ mentoring skills to inspire and teach others.
54.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	54.01 Identify and demonstrate positive work behaviors needed to be employable.
	54.02 Develop personal career plan that includes goals, objectives, and strategies.
	54.03 Examine licensing, certification, and industry credentialing requirements.
	54.04 Maintain a career portfolio to document knowledge, skills, and experience.
	54.05 Evaluate and compare employment opportunities that match career goals.
	54.06 Identify and exhibit traits for retaining employment.
	54.07 Identify opportunities and research requirements for career advancement.
	54.08 Research the benefits of ongoing professional development.
	54.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 4**
Course Number: **8206040**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts for business applications. The content includes client/server environments, interactive programming, and vendor application programming.

CTE Standards and Benchmarks	
55.0	Participate in work-based learning experiences. The student will be able to:
55.01	Participate in work-based learning experiences in a computer programming environment.
55.02	Compare and contrast programming languages used in a computer programming environment.
55.03	Discuss the management/supervisory skills needed in a computer programming environment.
56.0	Identify functions of information processing. The student will be able to:
56.01	Identify the advantages and disadvantages of blocking and buffering when accessing data on tape and disk storage.
57.0	Code programs. The student will be able to:
57.01	Access external files in a client/server environment.
58.0	Perform program maintenance. The student will be able to:
58.01	Modify or create new programs for vendor supplied applications.
58.02	Use a computer system with current commercial-end application software to solve problems within an organizational environment.
59.0	Evaluate assigned business computer programming tasks. The student will be able to:
59.01	Utilize and apply project and time management tools to control systems development.
60.0	Implement enhanced program structures. The student will be able to:
60.01	Write routines that incorporate “help” text.
60.02	Write interactive programs.
60.03	Design screen layouts for use in interactive programs.

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 5**
Course Number: **8206050**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts for business applications. The content includes client/server environments, interactive programming, and vendor application programming.

The competencies included in Business Programming 5 and 6 are designed to allow students to learn a second language. They build on the same tools as mastered in a previous language with increasing refinement of skill. Activities utilized must reflect increasingly greater complexity.

CTE Standards and Benchmarks	
61.0	Test programs. The student will be able to:
61.01	Develop a plan for testing programs.
61.02	Develop data for use in program testing.
61.03	Perform debugging activities.
61.04	Distinguish among the different types of program and design errors.
61.05	Evaluate program test results.
61.06	Execute programs and subroutines as they relate to the total application.
61.07	Use trace routines of compilers to assist in program debugging.
61.08	Compile and run programs.
62.0	Plan program design. The student will be able to:
62.01	Formulate a plan to determine program specifications individually or in groups.
62.02	Use a graphical representation or pseudocode to represent the structure in a program or subroutine.
62.03	Design programs to solve problems using problem-solving strategies.
62.04	Prepare proper input/output layout specifications.
62.05	Examine existing utility programs and subroutines for use with other programs.
62.06	Manually trace the execution of programs and verify that programs follow the logic of their design as documented.

CTE Standards and Benchmarks	
63.0	Code programs. The student will be able to:
63.01	Utilize reference manuals.
63.02	Write programs according to recognized programming standards.
63.03	Write internal documentation statements as needed in the program source code.
63.04	Code programs in high-level languages for business applications.
63.05	Write code that accesses sequential, indexed sequential, random, and direct files.
63.06	Code programs using logical statements (e.g., If-Then-Else, Do…While).
63.07	Enter and modify source code using a program language editor.
63.08	Code routines within programs that validate input data.
63.09	Use the rounding function in calculations within programs.
64.0	Perform program maintenance. The student will be able to:
64.01	Review requested modification of programs and establish a plan of action.
64.02	Design needed modifications in conformance with established standards.
64.03	Code, test, and debug modifications prior to updating production code.
64.04	Update production programs and documentation with changes.
64.05	Analyze output to identify and annotate errors or enhancements.
65.0	Create and maintain documentation. The student will be able to:
65.01	Write documentation to assist operators and end-users.
65.02	Follow established documentation standards.
65.03	Update existing documentation to reflect program changes.
66.0	Evaluate assigned business computer programming tasks. The student will be able to:
66.01	Utilize and apply project and time management tools to control systems development.
67.0	Implement enhanced program structures. The student will be able to:
67.01	Write programs that incorporate multi-level subtotals and page breaks.
67.02	Write programs that include tables or arrays and routines for data entry and lookup.
67.03	Write routines to sort arrays.

CTE Standards and Benchmarks
67.04 Write programs that sort records in files.
67.05 Write programs to create and maintain a master file.
67.06 Write programs to process transactions.
67.07 Write programs that use iteration.
67.08 Write programs that read and write sequential files.
67.09 Write programs that read and write indexed-sequential files.
67.10 Write programs that read and write random files.

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 6**
Course Number: **8206060**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts for business applications. The content includes client/server environments, interactive programming, and vendor application programming.

The competencies included in Business Programming 5 and 6 are designed to allow students to learn a second language. They build on the same tools as mastered in a previous language with increasing refinement of skill. Activities utilized must reflect increasingly greater complexity.

CTE Standards and Benchmarks	
68.0	Test programs. The student will be able to:
	68.01 Develop a plan for system integration testing.
69.0	Perform program maintenance. The student will be able to:
	69.01 Modify or create new programs for vendor supplied applications.
	69.02 Use a computer system with current commercial-end application software to solve problems within an organizational environment.
70.0	Evaluate assigned business computer programming tasks. The student will be able to:
	70.01 Utilize and apply project and time management tools to control systems development.
	70.02 Analyze computer resources necessary to run a program.
71.0	Demonstrate an understanding of operating systems, environments, and platforms. The student will be able to:
	71.01 Assess and analyze the functions of different operating systems.
	71.02 Assess and analyze the program development and execution utilities of relevant operating systems.
72.0	Develop an awareness of software quality assurance. The student will be able to:
	72.01 Evaluate performance, functionality, and validity of various software packages.
73.0	Implement enhanced program structures. The student will be able to:
	73.01 Write programs to import/export/convert data from external sources.
	73.02 Write routines that incorporate “help” text.

CTE Standards and Benchmarks	
	73.03 Write interactive programs.
	73.04 Design screen layouts for use in interactive programs.
	73.05 Write programs using object-oriented languages.
74.0	Develop an understanding of programming techniques and concepts. The student will be able to:
	74.01 Describe development methodologies, programming and system languages, database technologies, and data communication.

Florida Department of Education
Student Performance Standards

Course Title: **Business Computer Programming 7**
Course Number: **8206070**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts for business applications. The content includes client/server environments, interactive programming, and vendor application programming.

The competencies included in Business Programming 7 are designed to allow students to master a second language. They build on the same tools as mastered in a previous language with increasing refinement of skill. Activities utilized must reflect increasingly greater complexity.

CTE Standards and Benchmarks	
75.0	Test programs. The student will be able to:
75.01	Develop a plan for testing programs.
75.02	Develop a plan for system integration testing.
75.03	Develop data for use in program testing.
75.04	Perform debugging activities.
75.05	Distinguish among the different types of program and design errors.
75.06	Evaluate program test results.
75.07	Execute programs and subroutines as they relate to the total application.
75.08	Use trace routines of compilers to assist in program debugging.
75.09	Compile and run programs.
76.0	Plan program design. The student will be able to:
76.01	Formulate a plan to determine program specifications individually or in groups.
76.02	Use a graphical representation or pseudocode to represent the structure in a program or subroutine.
76.03	Design programs to solve problems using problem-solving strategies.
76.04	Prepare proper input/output layout specifications.
76.05	Examine existing utility programs and subroutines for use with other programs.

CTE Standards and Benchmarks	
	76.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
77.0	Code programs. The student will be able to:
	77.01 Utilize reference manuals.
	77.02 Write programs according to recognized programming standards.
	77.03 Write internal documentation statements as needed in the program source code.
	77.04 Code programs in high-level languages for business applications.
	77.05 Write code that accesses sequential, indexed sequential, random, and direct files.
	77.06 Code programs using logical statements (e.g., If-Then-Else, Do…While).
	77.07 Enter and modify source code using a program language editor.
	77.08 Code routines within programs that validate input data.
	77.09 Use the rounding function in calculations within programs.
78.0	Perform program maintenance. The student will be able to:
	78.01 Review requested modification of programs and establish a plan of action.
	78.02 Design needed modifications in conformance with established standards.
	78.03 Code, test, and debug modifications prior to updating production code.
	78.04 Update production programs and documentation with changes.
	78.05 Analyze output to identify and annotate errors or enhancements.
79.0	Implement enhanced program structures. The student will be able to:
	79.01 Write programs that include tables or arrays and routines for data entry and lookup.
	79.02 Write programs that use iteration.
	79.03 Write routines that incorporate “help” text.
	79.04 Write programs that read and write sequential files.
	79.05 Write programs that read and write indexed-sequential files.
	79.06 Write programs that read and write random files.
	79.07 Write interactive programs.
	79.08 Design screen layouts for use in interactive programs.

CTE Standards and Benchmarks
79.09 Write programs using object-oriented languages.
79.10 Write programs that include data structures (e.g., stacks, queues, trees, linked lists).
79.11 Write programs that are event-driven.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Network Systems Administration**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8207440
CIP Number	0511100125
Grade Level	9-12
Program Length	7 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1142 – Network and Computer Systems Administrators 15-1143 – Telecommunications Engineering Specialists
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Computer Support Assistant, Network Support Technician, Systems Administrator, Systems Engineer, Wireless Network Administrator, and Data Communications Analyst in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven (7) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
8207020	Networking 1	BUS ED 1 @2 VOE @7 TC COOP ED @7 BUS DP @7 %G ELECT DP @7 %G BOOKKEEPIN @4 7 G CLERICAL @7 G SECRETAR 7G TEC ELEC $7 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	1 credit	15-1151	2	CT
8207441	Networking 2, Administration		1 credit	15-1142	3	CT
8207442	Networking 3, Administration		1 credit	15-1142	3	CT
8207443	Networking 4, Administration		1 credit	15-1143	3	CT
8207060	Networking 5		1 credit	15-1143	3	CT
8207070	Networking 6		1 credit	15-1143	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
11.0 Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules.
12.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment.
13.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace.
14.0 Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems.
15.0 Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems.
16.0 Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked.
17.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, email, remote access, or direct contact.
18.0 Demonstrate proficiency using graphical user interface (GUI) operating systems.
19.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
20.0 Participate in work-based learning experiences.
21.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, email, remote access, or direct contact.
22.0 Perform installation and configuration activities.
23.0 Demonstrate proficiency using computer networks.
24.0 Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers.

25.0 Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability.
26.0 Demonstrate proficiency in managing, configuring and troubleshooting storage use.
27.0 Demonstrate proficiency in configuring and troubleshooting network connections.
28.0 Demonstrate proficiency in implementing, monitoring, and troubleshooting security.
29.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
30.0 Solve problems using critical thinking skills, creativity and innovation.
31.0 Use information technology tools.
32.0 Describe the roles within teams, work units, departments, organizations, interorganizational systems, and the larger environment.
33.0 Describe the importance of professional ethics and legal responsibilities.
34.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
35.0 Participate in work-based learning experiences.
36.0 Administer accounts and resources on computers running server operating system software in a networked environment.
37.0 Modify user and computer accounts on computers running a server operating system in a networked environment.
38.0 Perform various administrative functions using groups.
39.0 Enable resource access with permissions, manage access to files and folders using permissions, and manage permission inheritance.
40.0 Implement printing in a networked environment utilizing a particular server operating system.
41.0 Utilize available permissions for managing access to global directory objects, how to move objects between organizational units in the same domain, and how to delegate control of an organizational unit.
42.0 Use group policy to configure folder redirection, browser connectivity, and the desktop.
43.0 Manage computer security in a networking environment.
44.0 Administer servers remotely.
45.0 Monitor server performance by using performance tools, configure and manage performance logs, configure and manage alerts, and manage system monitor views.
46.0 Collect performance data by monitoring primary server subsystems and identify system bottlenecks by using the performance monitoring software.
47.0 Maintaining device drivers.
48.0 Use software tools to manage and set up disks.
49.0 Use file encryption for security of data.
50.0 Plan for a computer disaster and use the features of a server operating system to prevent a disaster or recover when one occurs.
51.0 Manage and distribute critical software updates that resolve known security vulnerabilities and other stability issues.
52.0 Construct and assign IP addresses and isolate addressing issues associated with the IP routing process.
53.0 Configure an internet protocol (IP) address for client computers.
54.0 Configure name resolution mechanisms for clients on a network and describe the name resolution process.
55.0 Isolate common connectivity issues and describe how to use utilities and tools as part of this process.
56.0 Configure a routing solution for a network environment.
57.0 Allocate IP addressing in a network environment.
58.0 Manage the DHCP service to reflect changing client IP addressing needs and monitor DHCP server performance.
59.0 Assign computer names to the IP addresses of the source and destination hosts, and then use the computer name to contact the hosts.
60.0 Resolve host names by using domain name system.

61.0 Manage and monitor DNS servers to ensure that they are functioning properly and to optimize network performance.
62.0 Configure a server with the routing and remote access service, create appropriate remote access connections on a network access server, and configure users' access rights.
63.0 Manage and monitor network access and the network access services.
64.0 Perform installation of a network client operating system.
65.0 Install and configure hardware devices.
66.0 Configure and manage file systems.
67.0 Troubleshoot the boot process and other system issues.
68.0 Configure the desktop.
69.0 Configure IP addresses and name resolution.
70.0 Configure the client to work in a network environment.
71.0 Support remote users.
72.0 Configure a client OS for mobile computing.
73.0 Monitor resources and performance.
74.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
75.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
76.0 Explain the importance of employability skill and entrepreneurship skills.
77.0 Apply communication skills (reading, writing, speaking, listening, and viewing) in a courteous, concise, and correct manner on personal and professional levels.
78.0 Participate in work-based learning experiences.
79.0 Plan a network infrastructure.
80.0 Plan and optimize a TCP/IP physical and logical network.
81.0 Plan and troubleshoot routing.
82.0 Plan a DHCP strategy.
83.0 Plan a DNS strategy.
84.0 Optimize and troubleshoot DNS.
85.0 Plan and troubleshoot IPSEC.
86.0 Plan a network access.
87.0 Troubleshoot network access.
88.0 Analyze global director infrastructure.
89.0 Implement a global directory structure and domain.
90.0 Implement an organizational unit structure.
91.0 Implement user, group, and computer accounts.
92.0 Implement group policy.
93.0 Deploy and manage software by using group policies.
94.0 Implement sites to manage global directory replication.
95.0 Implement placement of domain controllers.
96.0 Use a framework for designing security and create a security design team.
97.0 Recognize and predict common threats by using a threat model.

98.0 Apply a framework for planning risk management.
99.0 Design security for physical resources.
100.0 Design security for computers.
101.0 Design security for accounts.
102.0 Design security for authentication.
103.0 Design security for data.
104.0 Design security for data transmission.
105.0 Design security for network perimeter.
106.0 Design an audit policy and an incident response procedure.
107.0 Linux Foundation.
108.0 Linux Fundamentals.
109.0 Linux Installation.
110.0 Linux Operation.
111.0 Linux user Group and Permissions.
112.0 Linux Basic Security & System Monitoring.
113.0 Participate in work-based learning experiences.
114.0 Demonstrate proficiency in applying radio frequency (RF) technologies.
115.0 Develop an awareness of wireless LAN technologies.
116.0 Perform implementation and management activities.
117.0 Develop an awareness of wireless security systems.
118.0 Demonstrate knowledge of wireless industry standards.
119.0 Participate in work-based learning experiences.
120.0 Demonstrate knowledge of general security concepts.
121.0 Develop an awareness of communication security concepts.
122.0 Develop an awareness of network infrastructure security.
123.0 Develop an awareness of cryptography and its relation to security.
124.0 Incorporate organizational and operational security in an appropriate and effective manner.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Networking 1**
Course Number: **8207020**
Course Credit: **1**

Course Description:

This course is designed to develop competencies needed for employment in network support positions. The content includes instruction in basic hardware configuration, hardware and software troubleshooting, operating systems, and computer networking.

CTE Standards and Benchmarks	
10.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
10.01	Develop strategies for resolving customer conflicts.
11.0	Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. The student will be able to:
11.01	Identify and describe the functions of main processing boards.
11.02	Identify and describe the functions of communication ports.
11.03	Identify and describe the functions of peripheral devices.
11.04	Identify and describe the components of portable systems.
11.05	Troubleshoot, install and upgrade computers and peripherals.
11.06	Perform system hardware setup.
11.07	Demonstrate an understanding of input/output devices.
11.08	Installation and configuration of applications software, hardware, and device drivers.
11.09	Demonstrate an understanding of the operation and purpose of hardware components.
11.10	Install operating system software.
11.11	Customize operating systems.
11.12	Install application software.
11.13	Perform storage formatting and preparation activities.
11.14	Identify data measurement.

CTE Standards and Benchmarks	
	11.15 Install and configure RAID.
	11.16 Recognize and report on server room environmental issues.
12.0	Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to:
	12.01 Troubleshoot a personal computer system.
	12.02 Identify configuration problems.
	12.03 Identify software problems.
	12.04 Identify hardware malfunctions.
	12.05 Identify network malfunctions.
	12.06 Resolve computer error messages.
	12.07 Understand and troubleshoot memory and cache systems.
	12.08 Verify that drives are the appropriate type.
	12.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.
13.0	Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. The student will be able to:
	13.01 Apply basic rules for hardware safety.
	13.02 Demonstrate proficiency in basic preventative hardware maintenance.
	13.03 Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
	13.04 Apply ergonomic principles applicable to the configuration of computer workstations.
	13.05 Describe ethical issues and problems associated with computers and information systems**.**
14.0	Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. The student will be able to:
	14.01 Identify Random Access Memory (RAM) types.
	14.02 Identify I/O ports and devices.
15.0	Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. The student will be able to:
	15.01 Identify types of printers.
	15.02 Identify care and service techniques and common problems with primary printer types.

CTE Standards and Benchmarks	
	15.03 Implement and manage printing on a network.
16.0	Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The student will be able to:
	16.01 Define networking and describe the purpose of a network.
	16.02 Identify the purposes and interrelationships among the major components of networks.
	16.03 Describe the various types of network topologies.
	16.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
	16.05 Configure network and verify network connectivity.
	16.06 Discuss the responsibilities of the network.
	16.07 Develop user logon procedures.
	16.08 Utilize network management infrastructures to perform administrative tasks.
	16.09 Identify common backup strategies and procedures.
	16.10 Select and use appropriate electronic communications software and hardware for specific tasks.
	16.11 Compare and contrast Internet software and protocols.
	16.12 Diagnose and resolve electronic communications operational problems.
	16.13 Design and implement directory tree structures.
	16.14 Install services tools.
	16.15 Perform and verify backups.
	16.16 Identify bottlenecks.
	16.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
	16.18 Document and test disaster recovery plan regularly, and update as needed.
17.0	Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. The student will be able to:
	17.01 Apply call center vocabulary.
	17.02 Listen and input information simultaneously.
	17.03 Apply first response assistance for minor repair work.
18.0	Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to:

CTE Standards and Benchmarks
18.01 Identify parts of GUI windows.
18.02 Demonstrate proficiency in using menu systems.
18.03 Demonstrate proficiency in using pointing and selection devices.
18.04 Identify keyboard shortcuts and special function keys.
18.05 Demonstrate proficiency in manipulating windows.
18.06 Utilize help systems and hypertext links.
18.07 Create, organize, and maintain file system directories.
18.08 Organize desktop objects.
18.09 Run multiple applications.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 2, Administration**
Course Number: **8207441**
Course Credit: **1**

Course Description:

This course is designed to provide individuals with the knowledge necessary to understand and identify the tasks involved in supporting operating system within a large networking environment.

CTE Standards and Benchmarks	
19.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
19.01	Develop diplomatic methods to communicate with customers.
20.0	Participate in work-based learning experiences. The student will be able to:
20.01	Participate in work-based learning experiences in a network support services environment.
20.02	Discuss the use of technology in a network environment.
21.0	Perform end user support and assistance by troubleshooting and diagnosing through telephone, email, remote access, or direct contact. The student will be able to:
21.01	Apply first response assistance for minor repair work.
22.0	Perform installation and configuration activities. The student will be able to:
22.01	Configure the operating system environment.
22.02	Connect client workstation running similar operating system to the network.
22.03	Configure Internet access for a network.
22.04	Configure a web server.
22.05	Use remote server to deploy operating system.
22.06	Troubleshoot failed installations.
22.07	Install and configure network services for interoperability.
22.08	Monitor, configure troubleshoot and control access to printers.
22.09	Monitor, configure troubleshoot and control access to files, folders, and shared folders.

CTE Standards and Benchmarks	
	22.10 Monitor, configure troubleshoot and control access to websites.
23.0	Demonstrate proficiency using computer networks. The student will be able to:
	23.01 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
24.0	Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers. The student will be able to:
	24.01 Configure hardware devices.
	24.02 Configure driver signing options.
	24.03 Update device drivers.
	24.04 Troubleshoot problems with hardware.
25.0	Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability. The student will be able to:
	25.01 Monitor and optimize usage of system resources.
	25.02 Manage processes.
	25.03 Optimize disk performance.
	25.04 Manage and optimize availability of system data and user data.
	25.05 Recover systems and user data.
26.0	Demonstrate proficiency in managing, configuring and troubleshooting storage use. The student will be able to:
	26.01 Configure and manage user profiles.
	26.02 Monitor, configure and troubleshoot disks and volumes.
	26.03 Configure data compression.
	26.04 Monitor and configure disk quotas.
	26.05 Recover from disk failures.
27.0	Demonstrate proficiency in configuring and troubleshooting network connections. The student will be able to:
	27.01 Install, configure and troubleshoot shared access.
	27.02 Install, configure and troubleshoot a virtual private network.
	27.03 Install, configure and troubleshoot network protocols.
	27.04 Install and configure network services.
	27.05 Configure, monitor and troubleshoot remote access.

CTE Standards and Benchmarks	
	27.06 Install, configure, monitor, and troubleshoot Terminal Services.
	27.07 Configure the properties of a connection.
	27.08 Install, configure, and troubleshoot network adapters and drivers.
28.0	Demonstrate proficiency in implementing, monitoring, and troubleshooting security. The student will be able to:
	28.01 Encrypt data on a hard disk by using Encrypting File System.
	28.02 Implement, configure, manage and troubleshoot policies in an operating system environment.
	28.03 Implement, configure, manage and troubleshoot auditing.
	28.04 Implement, configure, manage and troubleshoot local accounts.
	28.05 Implement, configure, manage and troubleshoot account policy.
	28.06 Implement, configure, manage and troubleshoot security by using the Security Configuration Tool Set.
29.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	29.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	29.02 Locate, organize and reference written information from various sources.
	29.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	29.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	29.05 Apply active listening skills to obtain and clarify information.
	29.06 Develop and interpret tables and charts to support written and oral communications.
	29.07 Exhibit public relations skills that aid in achieving customer satisfaction.
30.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	30.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	30.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	30.03 Identify and document workplace performance goals and monitor progress toward those goals.
	30.04 Conduct technical research to gather information necessary for decision-making.
31.0	Use information technology tools. The student will be able to:
	31.01 Use personal information management (PIM) applications to increase workplace efficiency.
	31.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.

CTE Standards and Benchmarks	
	31.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	31.04 Employ collaborative/groupware applications to facilitate group work.
32.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	32.01 Describe the nature and types of business organizations.
	32.02 Explain the effect of key organizational systems on performance and quality.
	32.03 List and describe quality control systems and/or practices common to the workplace.
	32.04 Explain the impact of the global economy on business organizations.
33.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	33.01 Evaluate and justify decisions based on ethical reasoning.
	33.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	33.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	33.04 Interpret and explain written organizational policies and procedures.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 3, Administration**
Course Number: **8207442**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes the planning, implementation, and management of server and client operating systems in a networking environment.

CTE Standards and Benchmarks	
34.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
	34.01 Develop diplomatic methods to communicate with customers, clients, and end-users of information technology services.
35.0	Participate in work-based learning experiences. The student will be able to:
	35.01 Participate in work-based learning experiences in a network support services environment.
	35.02 Discuss the use of technology in a network support services environment.
	35.03 Discuss the management/supervisors skills needed in a network support services environment.
36.0	Administer accounts and resources on computers running server operating system software in a networked environment. The student will be able to:
	36.01 Describe features of server operating system.
	36.02 Log on to the server operating system.
	36.03 Install and configure administrative tools.
	36.04 Create user accounts.
	36.05 Create computer accounts.
	36.06 Create an organizational unit.
37.0	Modify user and computer accounts on computers running a server operating system in a networked environment. The student will be able to:
	37.01 Modify user and computer account properties.
	37.02 Enable and unlock user and computer accounts.
	37.03 Create a user account template.

CTE Standards and Benchmarks	
	37.04 Locate user and computer accounts in a global directory structure.
	37.05 Save queries.
	37.06 Reset user and computer accounts.
	37.07 Move domain objects.
38.0	Perform various administrative functions using groups. The student will be able to:
	38.01 Create groups.
	38.02 Manage group membership.
	38.03 Apply strategies for using groups.
	38.04 Modify groups.
	38.05 Manage default groups.
39.0	Enable resource access with permissions, manage access to files and folders using permissions, and manage permission inheritance. The student will be able to:
	39.01 Manage access to resources.
	39.02 Manage access to shared folders.
	39.03 Manage access to files and folders by using file system permissions.
	39.04 Determine effective permissions.
	39.05 Manage access to shared files by using offline caching.
40.0	Implement printing in a networked environment utilizing a particular server operating system. The student will be able to:
	40.01 Install and share printers.
	40.02 Manage access to printers by using shared printer permissions.
	40.03 Manage printer drivers.
	40.04 Implement printer locations.
	40.05 Change the location of the print spooler.
	40.06 Set printing priorities.
	40.07 Schedule printer availability.
	40.08 Configure a printing tool.
41.0	Utilize available permissions for managing access to global directory objects, how to move objects between organizational units in the same domain, and how to delegate control of an organizational unit. The student will be able to:

CTE Standards and Benchmarks	
	41.01 Identify the role of organizational units.
	41.02 Modify permissions for global directory objects.
	41.03 Delegate control of organizational units.
42.0	Use group policy to configure folder redirection, browser connectivity, and the desktop. The student will be able to:
	42.01 Configure group policy settings.
	42.02 Assign scripts with group policy.
	42.03 Configure folder redirection.
43.0	Manage computer security in a security in a networking environment. The student will be able to:
	43.01 Describe the security features a server operating system.
	43.02 Use security templates to secure computers.
	43.03 Test computer security policy.
	43.04 Configure auditing.
	43.05 Manage security logs.
44.0	Administer servers remotely. The student will be able to:
	44.01 Explain the tasks, tools, and rights that are required to administer a server.
	44.02 Configure remote access for administration and client preferences.
	44.03 Manage remote desktop connections.
45.0	Monitor server performance by using performance tools, configure and manage performance logs, configure and manage alerts, and manage system monitor views. The student will be able to:
	45.01 Establish a performance baseline.
	45.02 Perform real-time and logged monitoring.
	45.03 Configure and manage counter logs.
	45.04 Configure alerts.
46.0	Collect performance data by monitoring primary server subsystems and identify system bottlenecks by using the performance monitoring software. The student will be able to:
	46.01 Explain how the four primary server subsystems affect server performance.
	46.02 Monitor server memory.
	46.03 Monitor processor usage.

CTE Standards and Benchmarks	
	46.04 Monitor disks.
	46.05 Monitor network usage.
	46.06 Identify the guidelines for using counters and thresholds.
	46.07 Describe the best practices for monitoring server performance.
47.0	Maintain device drivers. The student will be able to:
	47.01 Configure device driver signing.
	47.02 Restore the previous version of a device driver.
48.0	Use software tools to manage and set up disks. The student will be able to:
	48.01 Initialize and partition a disk.
	48.02 View and update disk properties.
	48.03 Manage mounted drives.
	48.04 Create volumes on a disk.
	48.05 Convert a disk from basic to dynamic and from dynamic to basic.
	48.06 Import disks.
49.0	Use file encryption for security of data. The student will be able to:
	49.01 Manage disk based file compression.
	49.02 Configure file encryption.
	49.03 Implement disk quotas.
50.0	Plan for a computer disaster and use the features of a server operating system to prevent a disaster or recover when one occurs. The student will be able to:
	50.01 Prepare for disaster recovery.
	50.02 Back up data.
	50.03 Schedule backup jobs.
	50.04 Restore data.
	50.05 Configure a shadow copy.
	50.06 Recover from server failure.
	50.07 Select a disaster recovery method.

CTE Standards and Benchmarks	
51.0	Manage and distribute critical software updates that resolve known security vulnerabilities and other stability issues. The student will be able to:
	51.01 Install and configure client computers to use receive software updates.
	51.02 Install and configure servers to use perform software updates.
	51.03 Manage the Software Update Services infrastructure.
52.0	Construct and assign IP addresses and isolate addressing issues associated with the IP routing process. The student will be able to:
	52.01 Convert IP Addresses from decimal to binary.
	52.02 Calculate a subnet mask.
	52.03 Create subnets using VLSM and CIDR.
	52.04 Isolate addressing issues associated with the IP routing process.
53.0	Configure an internet protocol (IP) address for client computers. The student will be able to:
	53.01 Configure a client to use a static IP address.
	53.02 Configure a client to obtain an IP address automatically by using DHCP.
	53.03 Configure a client to obtain an IP address automatically by using Alternate Configuration.
54.0	Configure name resolution mechanisms for clients on a network and describe the name resolution process. The student will be able to:
	54.01 Use ARP to identify client media access control (MAC) addresses.
	54.02 Describe the function of Network Basic Input/Output System (NetBIOS).
	54.03 Configure a client to use a static IP address.
	54.04 Configure a client to use name resolution servers.
55.0	Isolate common connectivity issues and describe how to use utilities and tools as part of this process. The student will be able to:
	55.01 Isolate common connectivity issues.
	55.02 Use a flow chart to isolate a problem.
	55.03 Use utilities and tools to isolate a problem.
56.0	Configure a routing solution for a network environment. The student will be able to:
	56.01 Describe the role of routing in the network infrastructure.
	56.02 Enable and configure the Routing and Remote Access service.
	56.03 Configure packet filters.

CTE Standards and Benchmarks	
57.0	Allocate IP addressing in a network environment. The student will be able to:
57.01	Describe the role of DHCP in the network infrastructure.
57.02	Add and authorize a DHCP Server service.
57.03	Configure a DHCP scope.
57.04	Configure DHCP options.
57.05	Configure a DHCP reservation.
57.06	Configure a DHCP relay agent.
58.0	Manage the DHCP service to reflect changing client IP addressing needs and monitor DHCP server performance. The student will be able to:
58.01	Manage a DHCP database.
58.02	Monitor DHCP.
58.03	Apply security guidelines for DHCP.
59.0	Assign computer names to the IP addresses of the source and destination hosts, and then use the computer name to contact the hosts. The student will be able to:
59.01	Describe the name resolution process.
59.02	View names on a client.
59.03	Configure host name resolution.
60.0	Resolve host names by using domain name system. The student will be able to:
60.01	Describe the role of DNS in the network infrastructure.
60.02	Install the DNS Server service.
60.03	Configure the properties for the DNS Server service.
60.04	Configure the DNS zones.
60.05	Configure DNS zone transfers.
60.06	Configure dynamic updates.
60.07	Configure a DNS client.
60.08	Delegate authority for zones.
61.0	Manage and monitor DNS servers to ensure that they are functioning properly and to optimize network performance. The student will be able to:
61.01	Configure the Time-to-Live (TTL) value.

CTE Standards and Benchmarks	
	61.02 Configure aging and scavenging.
	61.03 Integrate DNS with WINS.
	61.04 Test the DNS server configuration.
	61.05 Monitor DNS server performance.
62.0	Configure a server with the routing and remote access service, create appropriate remote access connections on a network access server, and configure users' access rights. The student will be able to:
	62.01 Describe a network access infrastructure.
	62.02 Configure a virtual private network (VPN) connection.
	62.03 Configure a dial-up connection.
	62.04 Configure a wireless connection.
	62.05 Control remote user access to a network.
	62.06 Centralize authentication and policy management for network access by using Internet Authentication Service (IAS).
63.0	Manage and monitor network access and the network access services. The student will be able to:
	63.01 Configure logging on the network access server.
	63.02 Collect and monitor network access data.
64.0	Perform installation of a network client operating system. The student will be able to:
	64.01 Plan a client operating system installation.
	64.02 Install a client operating system.
	64.03 Upgrade a client operating system from an earlier version.
	64.04 Automate the installation process for a client operating system.
65.0	Install and configure hardware devices. The student will be able to:
	65.01 Configure hardware devices and drivers on a computer running a client OS.
	65.02 Add and remove devices by using built in utilities and wizards.
	65.03 Restore device drivers.
66.0	Configure and manage file systems. The student will be able to:
	66.01 Work with file systems.
	66.02 Manage data compression.

CTE Standards and Benchmarks	
	66.03 Secure data by using EFS.
	66.04 Configure disk compression.
	66.05 Secure files by using EFS.
67.0	Troubleshoot the boot process and other system issues. The student will be able to:
	67.01 Examine the boot process.
	67.02 Control system settings during the boot process.
	67.03 Change startup behavior.
	67.04 Use advanced boot options to troubleshoot startup problems.
	67.05 Restore a computer to a previous state.
	67.06 Troubleshoot the boot process and other system issues.
68.0	Configure the desktop. The student will be able to:
	68.01 Configure user desktop settings.
	68.02 Customize the desktop environment.
	68.03 Configure system settings.
	68.04 Describe how user profiles and group policy affect desktop customization.
69.0	Configure IP addresses and name resolution. The student will be able to:
	69.01 Configure IP addresses.
	69.02 Troubleshoot IP addresses.
	69.03 Determine TCP/IP name resolution methods.
	69.04 Configure a DNS and WINS client.
	69.05 Connect to a remote host.
	69.06 Configure IP addresses.
	69.07 Configure the DNS client.
70.0	Configure the client to work in a network environment. The student will be able to:
	70.01 Examine workgroups and user accounts.
	70.02 Create and authenticate local user accounts.

CTE Standards and Benchmarks	
	70.03 Configure local security.
	70.04 Configure logon options.
	70.05 Configure networking.
	70.06 Join a domain.
	70.07 Operate in a domain.
71.0	Support remote users. The student will be able to:
	71.01 Establish remote access connections.
	71.02 Connect to Virtual Private Networks.
	71.03 Configure inbound connections.
	71.04 Configure authentication protocols and encryption.
	71.05 Using remote desktop.
	71.06 Store user names and passwords to facilitate remote connections.
	71.07 Configure a VPN connection.
	71.08 Configure and using remote desktop.
	71.09 Store user names and passwords.
72.0	Configure a client OS for mobile computing. The student will be able to:
	72.01 Configure hardware for mobile computing.
	72.02 Configure power management options for mobile computing.
	72.03 Make files, folders, and webpages available for offline use.
73.0	Monitor resources and performance. The student will be able to:
	73.01 Determine system information.
	73.02 Use task manager to monitor system performance.
	73.03 Use performance and maintenance tools to improve performance.
	73.04 Monitor event logs.
	73.05 Configure program compatibility.
74.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:

CTE Standards and Benchmarks	
	74.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	74.02 Explain emergency procedures to follow in response to workplace accidents.
	74.03 Create a disaster and/or emergency response plan.
75.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	75.01 Employ leadership skills to accomplish organizational goals and objectives.
	75.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	75.03 Conduct and participate in meetings to accomplish work tasks.
	75.04 Employ mentoring skills to inspire and teach others.
76.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	76.01 Identify and demonstrate positive work behaviors needed to be employable.
	76.02 Develop personal career plan that includes goals, objectives, and strategies.
	76.03 Examine licensing, certification, and industry credentialing requirements.
	76.04 Maintain a career portfolio to document knowledge, skills, and experience.
	76.05 Evaluate and compare employment opportunities that match career goals.
	76.06 Identify and exhibit traits for retaining employment.
	76.07 Identify opportunities and research requirements for career advancement.
	76.08 Research the benefits of ongoing professional development.
	76.09 Examine and describe entrepreneurship opportunities as a career planning option.
	76.10 Research, compare and contrast investment opportunities.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 4, Administration**
Course Number: **8207443**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes the planning, implementation, and management of server and client operating systems in a networking environment.

CTE Standards and Benchmarks	
77.0	Apply communication skills (reading, writing, speaking, listening, viewing) in a courteous, concise, and correct manner on personal and professional levels. The student will be able to:
	77.01 Communicate technical information in a concise, understandable manner to a non-technical audience both verbally and in writing.
78.0	Participate in work-based learning experiences. The student will be able to:
	78.01 Participate in work-based learning experiences in a network support services environment.
	78.02 Discuss the use of technology in a network support services environment.
	78.03 Compare and contrast the software applications used in a network support services environment.
79.0	Plan a network infrastructure. The student will be able to:
	79.01 Explain how to plan a network.
	79.02 Explain how to prepare development and test environments.
	79.03 Explain the concepts of managing and maintaining a network environment by using specific tools.
	79.04 Explain the technologies and services implemented in a network.
80.0	Plan and optimize a TCP/IP physical and logical network. The student will be able to:
	80.01 Discuss TCP/IP.
	80.02 Plan a TCP/IP addressing scheme.
	80.03 Optimize network performance.
81.0	Plan and troubleshoot routing. The student will be able to:
	81.01 Describe how routing works.
	81.02 Create a secure routing plan.

CTE Standards and Benchmarks	
	81.03 Identify TCP/IP routing trouble shooting tools.
	81.04 Troubleshoot TCP/IP routing.
82.0	Plan a DHCP strategy. The student will be able to:
	82.01 Demonstrate how DHCP operates in an enterprise environment.
	82.02 Plan a DHCP strategy.
	82.03 Secure a DHCP strategy.
83.0	Plan a DNS strategy. The student will be able to:
	83.01 Plan a namespace strategy.
	83.02 Plan zones.
	83.03 Plan zone replication.
	83.04 Plan a DNS server implementation.
84.0	Optimize and troubleshoot DNS. The student will be able to:
	84.01 Optimize a DNS server.
	84.02 Optimize the DNS server-to-server communications.
	84.03 Optimize DNS client support traffic.
	84.04 Troubleshoot host name resolution.
85.0	Plan and troubleshoot IPSEC. The student will be able to:
	85.01 Discuss IPSec.
	85.02 Understand IPSec default policies, rules, and settings.
	85.03 Plan IPSec deployment.
	85.04 Troubleshoot IPSec.
86.0	Plan a network access. The student will be able to:
	86.01 Select appropriate connection methods for a network access strategy.
	86.02 Select a remote access policy strategy.
	86.03 Select a network access authentication method.
	86.04 Plan a network access strategy.

CTE Standards and Benchmarks	
87.0	Troubleshoot network access. The student will be able to:
87.01	Identify network access troubleshooting resources.
87.02	Troubleshoot network authentication.
87.03	Troubleshoot LAN authentication.
87.04	Troubleshoot remote access.
88.0	Analyze global director infrastructure. The student will be able to:
88.01	Describe the architecture of global directory.
88.02	Describe the working of global directory.
88.03	Use administrative tools to examine the components of global directory.
88.04	Describe the global directory design, planning, and implementation processes.
89.0	Implement a global directory structure and domain structure. The student will be able to:
89.01	Create a forest and domain structure.
89.02	Configure DNS in a global directory environment.
89.03	Raise the functional level of a forest and a domain.
89.04	Create trust relationships between domains.
89.05	Secure trusts by using SID filtering.
90.0	Implement an organizational unit structure. The student will be able to:
90.01	Create an organizational unit.
90.02	Delegate control for an organizational unit.
90.03	Plan an organization unit strategy.
91.0	Implement user, group, and computer accounts. The student will be able to:
91.01	Describe the types of global directory accounts and groups.
91.02	Create multiple user and computer accounts.
91.03	Implement UPN suffixes.
91.04	Move objects within a domain and across domains in a global structure.
91.05	Plan a strategy for user computer and group accounts.

CTE Standards and Benchmarks	
	91.06 Plan a global directory audit strategy.
92.0	Implement group policy. The student will be able to:
	92.01 Create and configure group policy objects.
	92.02 Manage group policy objects.
	92.03 Verify and troubleshoot group policies.
	92.04 Delegate administrative control of group policies.
	92.05 Plan a group policies strategy for the enterprise.
93.0	Deploy and manage software by using group policies. The student will be able to:
	93.01 Explain the basic concepts of software deployment by using group policies.
	93.02 Deploy software by using group policies.
	93.03 Configure software deployment by using group policies.
	93.04 Maintain deployed software by using group policies.
	93.05 Troubleshoot some common problems with software deployment.
	93.06 Plan a software deployment strategy.
94.0	Implement sites to manage global directory replication. The student will be able to:
	94.01 Explain the components and the process of replication.
	94.02 Create and configure sites.
	94.03 Manage a global directory site topology.
	94.04 Monitor and troubleshoot global directory replication failures.
	94.05 Plan a site strategy.
95.0	Implement placement of domain controllers. The student will be able to:
	95.01 Implement a global catalog in a global directory.
	95.02 Determine the placement of domain controllers in a global directory.
	95.03 Create a plan for placing domain controllers in a global directory.
96.0	Use a framework for designing security and create a security design team. The student will be able to:
	96.01 Describe common elements of security policies and procedures.

CTE Standards and Benchmarks	
	96.02 Create a security design framework.
	96.03 Create a security design team.
97.0	Recognize and predict common threats by using a threat model. The student will be able to:
	97.01 Explain common network vulnerabilities and how attackers can exploit them.
	97.02 Predict threats to security by using the STRIDE (Spoofing, Tampering, Repudiation, Information disclosure, Denial of service, Elevation of privilege) threat model.
98.0	Apply a framework for planning risk management. The student will be able to:
	98.01 Explain the purpose and operation of risk management.
	98.02 Draft the elements of a risk management plan.
99.0	Design security for physical resources. The student will be able to:
	99.01 Determine threats and analyze risks to physical resources.
	99.02 Design security for physical resources.
100.0	Design security for computers. The student will be able to:
	100.01 Determine threats and analyze risks to computers.
	100.02 Design security for computers.
101.0	Design security for accounts. The student will be able to:
	101.01 Determine threats and analyze risks to accounts.
	101.02 Design security for accounts.
102.0	Design security for authentication. The student will be able to:
	102.01 Determine threats and analyze risks to authentication.
	102.02 Design security for authentication.
103.0	Design security for data. The student will be able to:
	103.01 Determine threats and analyze risks to data.
	103.02 Design security for data.
104.0	Design security for data transmission. The student will be able to:
	104.01 Determine threats and analyze risks to data transmission.
	104.02 Design security for data transmission.

CTE Standards and Benchmarks	
105.0	Design security for network perimeters. The student will be able to:
105.01	Determine threats and analyze risks to network perimeters.
105.02	Design security for network perimeters.
106.0	Design an audit policy and an incident response procedure. The student will be able to:
106.01	Explain the importance of auditing and incident response.
106.02	Design an auditing policy.
106.03	Design an incident response procedure.
107.0	Linux Foundation. The student will be able to:
107.01	Explain the creation history of Linux.
107.02	Explain Free and Open Source Software (FOSS).
107.03	Explain the concept of a GNU General Public License (GPL).
107.04	Explain the concept of a Linux distribution and name some well-known distributions.
107.05	Site common uses of Linux and its roles in global networks.
108.0	Linux Fundamentals. The student will be able to:
108.01	Access and utilize the command line interface shell.
108.02	Explain the purpose of and demonstrate the use of the super user and super user do (sudo) command.
108.03	Know where to get help and how to use the manual (man) pages.
108.04	Use non-graphical text editors such as vi and nano.
108.05	Use and create command aliases.
108.06	Adjust environmental variables and shell configuration files.
108.07	Demonstrate redirection, piping, standard input, standard output, & standard error.
108.08	Work with Directories, links, and files.
108.09	Describe the most common Filesystem Hierarchy Standard (FHS).
108.10	Compress and decompress files using standard Linux utilities.
109.0	Linux Installation. The student will be able to:
109.01	Plan and perform a Linux installation including harddrive partitioning, Logical Volumes (LV), and basic Logical Volume Management (LVM) operation.

CTE Standards and Benchmarks	
	109.02 Install various distributions of Linux in server and client modes.
	109.03 Explain the boot loader and describe the most common boot loader, GRUB2.
110.0	Linux System Operation. The student will be able to:
	110.01 Start, display, and kill running processes.
	110.02 Explain the purpose of the Process ID (PID).
	110.03 Explain the relationship of parent, child, and zombie processes.
	110.04 Explain the role of systemd.
	110.05 Update and upgrade running Linux systems.
	110.06 Describe the use of shared libraries.
	110.07 Mount volumes.
111.0	Linux Users Groups and Permissions. The student will be able to:
	111.01 Display existing groups and users.
	111.02 Create users.
	111.03 Explain the use of the shadow password file.
	111.04 Create groups.
	111.05 Assign users to groups.
	111.06 Explain how Linux uses file and folder ownership and group permissions.
	111.07 Change ownership and group ownership of files and folders.
	111.08 Explain the attributes read, write, execute (rwx).
	111.09 Demonstrate the ability to change attributes using the single, multiple, and binary methods.
	111.10 Describe the use of special permissions.
112.0	Linux Basic Security & System Monitoring. The student will be able to:
	112.01 Configure network interfaces for IPv4 and IPv6.
	112.02 Display iptables and create a new firewall rule.
	112.03 Demonstrate the ability to read and manipulate system & security log files using head, tail, cat, less, and more.
	112.04 Demonstrate the ability to backup system & security logs.

CTE Standards and Benchmarks
112.05 Create basic scripts to automate tasks.
112.06 Block logins, disable, and re-enable accounts.
112.07 Remove un-needed services and disable unused ports.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 5**
Course Number: **8207060**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes wireless networking technologies, implementation, management and security.

CTE Standards and Benchmarks	
113.0	Participate in simulated work-based learning experiences. The student will be able to:
113.01	Participate in simulated work-based learning experiences in a network support services environment.
113.02	Discuss the use of technology in a network support services environment.
113.03	Discuss the management/supervisory skills needed in a network support service environment.
114.0	Demonstrate proficiency in applying radio frequency (RF) technologies. The student will be able to:
114.01	Define and apply the basic concepts of RF behavior.
114.02	Understand the applications of basic RF antenna concepts.
114.03	Understand and apply the basic components of RF.
114.04	Identify some of the different uses for spread spectrum technologies.
114.05	Comprehend the differences between, and apply the different types of spread spectrum technologies.
114.06	Identify and apply the concepts which make up the functionality of spread spectrum technology.
114.07	Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times.
115.0	Develop an awareness of wireless LAN technologies. The student will be able to:
115.01	Identify and apply the processes involved in authentication and association.
115.02	Recognize the concepts associated with wireless LAN service sets.
115.03	Understand the implications of the following power management features of wireless LANs.
115.04	Specify the modes of operation involved in the movement of data traffic across wireless LANs.
116.0	Perform implementation and management activities. The student will be able to:

CTE Standards and Benchmarks	
	116.01 Identify the technology roles for which wireless LAN technology is an appropriate technology application.
	116.02 Identify the purpose of infrastructure devices and explain how to install, configure, and manage them.
	116.03 Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them.
	116.04 Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them.
	116.05 Identify the basic attributes, purpose, and function of types of antennas.
	116.06 Describe the proper locations and methods for installing antennas.
	116.07 Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas.
	116.08 Identify the use of wireless LAN accessories and explain how to install, configure, and manage them.
	116.09 Identify, understand, correct or compensate for wireless LAN implementation challenges.
	116.10 Explain how antenna diversity compensates for multipath.
	116.11 Identify and understand the importance and process of conducting a thorough site survey.
	116.12 Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey.
	116.13 Identify the necessary equipment involved in performing a site survey.
	116.14 Understand the necessary procedures involved in performing a site survey.
	116.15 Identify and understand site survey reporting procedures.
117.0	Develop an awareness of wireless security systems. The student will be able to:
	117.01 Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques including the use of WVLAN's.
	117.02 Describe types of wireless LAN security attacks, and explain how to identify and prevent them.
	117.03 Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions.
	117.04 Explain the uses of corporate security policies and how they are used to secure a wireless LAN.
	117.05 Identify how and security precautions are used to secure a wireless LAN.
118.0	Demonstrate knowledge of wireless industry standards. The student will be able to:
	118.01 Identify, apply and comprehend the differences between wireless LAN standards.
	118.02 Understand the roles of organizations in providing direction and accountability within the wireless LAN industry.
	118.03 Identify the differences between the ISM and UNII bands.
	118.04 Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 6**
Course Number: **8207070**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes network security.

CTE Standards and Benchmarks	
119.0	Participate in simulated work-based learning experiences. The student will be able to:
119.01	Participate in simulated work-based learning experiences in a network support services environment.
119.02	Discuss the use of technology in a network support services environment.
119.03	Discuss the management/supervisors skills needed in a network support services environment.
120.0	Demonstrate a knowledge of general security concepts. The student will be able to:
120.01	Describe access control.
120.02	Describe network authentication.
120.03	Understand the various types of network attacks (backdoors, DOS, spoofing).
120.04	Identify and modify non-essential services and protocols.
120.05	Identify malicious code (virus, worm, Trojan).
120.06	Configure system auditing, logging, and scanning as it relates to security procedures.
121.0	Develop an awareness of communication security concepts. The student will be able to:
121.01	Describe remote access protocols (VPN, RADIUS, L2TP).
121.02	Identify E-mail security concerns (hoaxes, spam).
121.03	Identify web (HTML) security concepts and designs (HTTP/S, IM).
121.04	Demonstrate an awareness of file transfer security concerns.
121.05	Describe and identify wireless networking security concerns and vulnerabilities.
122.0	Develop an awareness of network infrastructure security. The student will be able to:
122.01	Install and configure network firewalls.

CTE Standards and Benchmarks	
	122.02 Identify security concerns with various wiring media (copper, fiber).
	122.03 Identify security concerns associated with removable media and storage devices.
	122.04 Demonstrate an awareness of security topologies (security zones, Intranets, NAT).
	122.05 Configure and use intrusion detection software.
	122.06 Establish security baselines (updates, patches, hot fixes, Access Control lists).
	122.07 Demonstrate the ability to configure a Virtual Private Network (VPN).
	122.08 Describe the function of Network Address Translation (NAT).
123.0	Develop an awareness of cryptography and its relation to security. The student will be able to:
	123.01 Demonstrate an understanding of security algorithms and encryption.
	123.02 Use and apply Public Key Certificates.
	123.03 Demonstrate an understanding of standards and protocols in commerce.
124.0	Incorporate organizational and operational security in an appropriate and effective manner. The student will be able to:
	124.01 Describe how to establish a network security policy.
	124.02 Explain the importance of physical security to protect network resources.
	124.03 Identify and use disaster recovery procedures.
	124.04 Describe the importance of business continuity and its relationship to network and corporate security.
	124.05 Describe security policies and procedures that would be used in a business environment.
	124.06 Explain the importance of privilege management (access, password management, sign-on).
	124.07 Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches).
	124.08 Explain the importance of educating users and supervisors in regard to network security.
	124.09 Create documentation that describes standards and guidelines for a network security system.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Network Support Services**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8208000
CIP Number	0511090109
Grade Level	9-12
Program Length	7 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1142 – Network and Computer Systems Administrators 15-1143 – Computer Network Architects
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in network support services positions in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven (7) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
8207020	Networking 1	BUS ED 1 @2 VOE @7 TC COOP ED @7 BUS DP @7 %G ELECT DP @7 %G BOOKKEEPIN @4 7 G CLERICAL @7 G SECRETAR 7G TEC ELEC $7 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	1 credit	15-1151	2	CT
8207030	Networking 2, Infrastructure		1 credit	15-1142	3	CT
8207040	Networking 3, Infrastructure		1 credit	15-1142	3	CT
8207050	Networking 4, Infrastructure		1 credit	15-1143	3	CT
8207060	Networking 5		1 credit	15-1143	3	CT
8207070	Networking 6		1 credit	15-1143	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
11.0 Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules.
12.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment.
13.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace.
14.0 Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems.
15.0 Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems.
16.0 Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked.
17.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact.
18.0 Demonstrate proficiency using graphical user interface (GUI) operating systems.
19.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
20.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact.
21.0 Understand, describe, and explain internet connections.
22.0 Define networking terminology.
23.0 Explain how to connect copper media, optical media, and wireless media.
24.0 Perform tasks related to the network cable testing and cable making.

25.0 Define network topologies, devices and connections.
26.0 Define Ethernet fundamentals and operations.
27.0 Define and explain the functions of bridges and switches.
28.0 Explain the mathematical concepts and protocols behind the internet.
29.0 Define and explain the difference between routed and routing protocols.
30.0 Recognize, define, and explain functions of the transport layer.
31.0 Explain, define, and identify the components of a WAN and router.
32.0 Describe and identify an operating system for a router.
33.0 Explain how to establish connections between neighboring routers.
34.0 Identify and explain the router boot sequence and file system.
35.0 Identify and explain static and dynamic routing protocols.
36.0 Describe and configure distance vector protocols.
37.0 Perform tasks related to protocol troubleshooting.
38.0 Examine and test networks.
39.0 Define, explain and describe access lists.
40.0 Solve problems using critical thinking skills, creativity and innovation.
41.0 Use information technology tools.
42.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
43.0 Describe the importance of professional ethics and legal responsibilities.
44.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
45.0 Participate in simulated work-based learning experiences.
46.0 Provide network support and assistance by troubleshooting and diagnosing through direct contact remote access.
47.0 Perform logical and physical network design activities.
48.0 Demonstrate proficiency in selecting appropriate various routing protocols and IP routing configuration for various network designs.
49.0 Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security.
50.0 Perform network management activities related to documentation, security, performance, administration, troubleshooting and coping with environmental factors.
51.0 Identify and describe various van functions, devices, and demonstrate understanding of the wan design process.
52.0 Describe the operation and implementation of virtual private networks.
53.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
54.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
55.0 Explain the importance of employability skill and entrepreneurship skills.
56.0 Demonstrate personal money-management concepts, procedures, and strategies.
57.0 Participate in simulated work-based learning experiences.
58.0 Compare and contrast hierarchical network design models and scalable internetworks.
59.0 Discuss advanced IP addressing management.
60.0 Demonstrate proficiency in basic router configuration.
61.0 Demonstrate proficiency in the use of OSPF.

62.0 Understand and discuss multi-area OSPF operation and configuration.
63.0 Demonstrate the use of stub and totally stubby areas.
64.0 Demonstrate proficiency in route optimization.
65.0 Demonstrate proficiency in the use of BGP.
66.0 Define and show proficiency in security.
67.0 Use lab equipment, demonstrate the setup, configuration, connectivity of routers to create a small WAN.
68.0 Configure and monitor DSL and DDR.
69.0 Demonstrate the use of scaling IP addresses with NAT.
70.0 Demonstrate proficiency using Authentication, Authorization & Accounting AAA to scale access control.
71.0 Understand and describe key characteristics of various switching technologies, LAN switching and the hierarchical model of network design, and the 3-tier model.
72.0 Understand and describe campus networks, design models, and switching technologies.
73.0 Show proficiency configuring a switch.
74.0 Demonstrate proficiency configuring VLANS.
75.0 Understand and explain spanning tree protocol (STP) and redundant links.
76.0 Demonstrate proficiency with multilayer switching.
77.0 Demonstrate the use of hot standby routing protocol (HSRP).
78.0 Understand and use IGMP and multicasting.
79.0 Demonstrate proficiency restricting network access.
80.0 Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools.
81.0 List and define the commonly used protocols, routing techniques, and switching processes.
82.0 Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANS, frame relay, and ISDN.
83.0 Participate in simulated work-based learning experiences.
84.0 Demonstrate proficiency in applying radio frequency (RF) technologies.
85.0 Develop an awareness of wireless LAN technologies.
86.0 Perform implementation and management activities.
87.0 Develop an awareness of wireless security systems.
88.0 Demonstrate knowledge of wireless industry standards.
89.0 Participate in simulated work-based learning experiences.
90.0 Demonstrate knowledge of general security concepts.
91.0 Develop an awareness of communication security concepts.
92.0 Develop an awareness of network infrastructure security.
93.0 Develop an awareness of cryptography and its relation to security.
94.0 Incorporate organizational and operational security in an appropriate and effective manner.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Networking 1**
Course Number: **8207020**
Course Credit: **1**

Course Description:

This course is designed to develop competencies needed for employment in network support positions. The content includes instruction in basic hardware configuration, hardware and software troubleshooting, operating systems, and computer networking.

CTE Standards and Benchmarks	
10.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
10.01	Develop strategies for resolving customer conflicts.
11.0	Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. The student will be able to:
11.01	Identify and describe the functions of main processing boards.
11.02	Identify and describe the functions of communication ports.
11.03	Identify and describe the functions of peripheral devices.
11.04	Identify and describe the components of portable systems.
11.05	Troubleshoot, install and upgrade computers and peripherals.
11.06	Perform system hardware setup.
11.07	Demonstrate an understanding of input/output devices.
11.08	Installation and configuration of applications software, hardware, and device drivers.
11.09	Demonstrate an understanding of the operation and purpose of hardware components.
11.10	Install operating system software.
11.11	Customize operating systems.
11.12	Install application software.
11.13	Perform storage formatting and preparation activities.
11.14	Identify data measurement.

CTE Standards and Benchmarks	
	11.15 Install and configure RAID.
	11.16 Recognize and report on server room environmental issues.
12.0	Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to:
	12.01 Troubleshoot a personal computer system.
	12.02 Identify configuration problems.
	12.03 Identify software problems.
	12.04 Identify hardware malfunctions.
	12.05 Identify network malfunctions.
	12.06 Resolve computer error messages.
	12.07 Understand and troubleshoot memory and cache systems.
	12.08 Verify that drives are the appropriate type.
	12.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.
13.0	Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. The student will be able to:
	13.01 Apply basic rules for hardware safety.
	13.02 Demonstrate proficiency in basic preventative hardware maintenance.
	13.03 Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
	13.04 Apply ergonomic principles applicable to the configuration of computer workstations.
	13.05 Describe ethical issues and problems associated with computers and information systems**.**
14.0	Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. The student will be able to:
	14.01 Identify Random Access Memory (RAM) types.
	14.02 Identify I/O ports and devices.
15.0	Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. The student will be able to:
	15.01 Identify types of printers.
	15.02 Identify care and service techniques and common problems with primary printer types.

CTE Standards and Benchmarks	
	15.03 Implement and manage printing on a network.
16.0	Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The student will be able to:
	16.01 Define networking and describe the purpose of a network.
	16.02 Identify the purposes and interrelationships among the major components of networks.
	16.03 Describe the various types of network topologies.
	16.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
	16.05 Configure network and verify network connectivity.
	16.06 Discuss the responsibilities of the network.
	16.07 Develop user logon procedures.
	16.08 Utilize network management infrastructures to perform administrative tasks.
	16.09 Identify common backup strategies and procedures.
	16.10 Select and use appropriate electronic communications software and hardware for specific tasks.
	16.11 Compare and contrast Internet software and protocols.
	16.12 Diagnose and resolve electronic communications operational problems.
	16.13 Design and implement directory tree structures.
	16.14 Install services tools.
	16.15 Perform and verify backups.
	16.16 Identify bottlenecks.
	16.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
	16.18 Document and test disaster recovery plan regularly, and update as needed.
17.0	Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. The student will be able to:
	17.01 Apply call center vocabulary.
	17.02 Listen and input information simultaneously.
	17.03 Apply first response assistance for minor repair work.
18.0	Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to:

CTE Standards and Benchmarks
18.01 Identify parts of GUI windows.
18.02 Demonstrate proficiency in using menu systems.
18.03 Demonstrate proficiency in using pointing and selection devices.
18.04 Identify keyboard shortcuts and special function keys.
18.05 Demonstrate proficiency in manipulating windows.
18.06 Utilize help systems and hypertext links.
18.07 Create, organize, and maintain file system directories.
18.08 Organize desktop objects.
18.09 Run multiple applications.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 2, Infrastructure**
Course Number: **8207030**
Course Credit: **1**

Course Description:

This course focuses on understanding network terminology and protocols, local-area networks, wide-area networks, OSI models, cabling, cabling tools, routers, router programming, Ethernet, IP addressing and network standards.

CTE Standards and Benchmarks	
19.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
	19.01 Develop diplomatic methods to communicate with customers.
20.0	Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. The student will be able to:
	20.01 Apply first response assistance for minor repair work.
21.0	Understand, describe, and explain internet connections. The student will be able to:
	21.01 Understand the physical connectivity necessary for a computer to connect to the Internet.
	21.02 Recognize the primary components of a computer.
	21.03 Install and troubleshoot network interface cards and/or modems.
	21.04 Use basic testing procedures to test the Internet connection.
	21.05 Demonstrate a basic understanding of the use of web browsers and plug-ins.
22.0	Define networking terminology. The student will be able to:
	22.01 Explain the importance of bandwidth in networking.
	22.02 Identify bps, kbps, Mbps, and Gbps as units of bandwidth.
	22.03 Explain the difference between bandwidth and throughput.
	22.04 Explain the development of the Open System Interconnection model (OSI).
	22.05 List the advantages of a layered approach.
	22.06 Identify each of the seven layers of the OSI model.

CTE Standards and Benchmarks	
	22.07 Identify the four layers of the TCP/IP model.
	22.08 Describe the similarities and differences between the two models.
	22.09 Briefly outline the history of networking.
	22.10 Identify devices used in networking.
	22.11 Understand the role of protocols in networking.
	22.12 Define types of area networks.
	22.13 Explain VPNs and their advantages.
	22.14 Describe the differences between intranets and extranets.
23.0	Explain how to connect copper media, optical media, and wireless media. The student will be able to:
	23.01 Discuss the electrical properties of matter.
	23.02 Define voltage, resistance, impedance, current, and circuits.
	23.03 Describe the specifications and performances of different types of cable.
	23.04 Describe coaxial cable and its advantages and disadvantages over other types of cable.
	23.05 Describe shielded twisted-pair (STP) cable and unshielded twisted-pair cable (UTP) and its uses.
	23.06 Discuss the characteristics of straight-through, crossover, and rollover cables and where each is used.
	23.07 Explain the basics of fiber-optic cable.
	23.08 Describe how fibers can guide light for long distances.
	23.09 Describe multimode and single-mode fiber.
	23.10 Describe how fiber is installed.
	23.11 Describe the type of connectors and equipment used with fiber-optic cable.
	23.12 Explain how fiber is tested to ensure that it will function properly.
	23.13 Discuss safety issues dealing with fiber-optics.
24.0	Perform tasks related to network cable testing and cable making. The student will be able to:
	24.01 Differentiate between sine waves and square waves.
	24.02 Define basic terminology related to time, frequency, and noise.
	24.03 Differentiate between digital bandwidth and analog bandwidth.

CTE Standards and Benchmarks	
	24.04 Compare and contrast noise levels on various types of cabling.
	24.05 Define and describe the effects of attenuation and impedance mismatch.
	24.06 Define crosstalk, near-end crosstalk, far-end crosstalk, and power sum near-end crosstalk.
	24.07 Describe how crosstalk and twisted pairs help reduce noise.
	24.08 Describe the ten copper cable tests defined in TIA/EIA-568-A/B.
	24.09 Describe the difference between Category 5 and Category 6 cable.
25.0	Define network topologies, devices and connections. The student will be able to:
	25.01 Identify characteristics of Ethernet networks.
	25.02 Identify straight-through, crossover, and rollover cable.
	25.03 Describe various intermediary network devices.
	25.04 Describe the function of peer-to-peer networks.
	25.05 Describe the function, advantages, and disadvantages of client-server networks.
	25.06 Describe and differentiate between serial, digital subscriber line (DSL), and cable modem WAN connections.
	25.07 Identify router serial ports and their cable and connectors.
	25.08 Identify and describe the placement of equipment used in various WAN configurations.
26.0	Define Ethernet fundamentals and operations. The student will be able to:
	26.01 Describe the basics of Ethernet technology.
	26.02 Explain naming rules of Ethernet technology.
	26.03 Define how Ethernet and the OSI model interact.
	26.04 Describe the Ethernet framing process and frame structure.
	26.05 List Ethernet frame field names and purposes.
	26.06 Identify the characteristics of CSMA/CD.
	26.07 Describe the key aspects of Ethernet timing, interframe spacing and backoff time after a collision.
	26.08 Define Ethernet errors and collisions.
	26.09 Explain the concept of auto-negotiation in relation to speed and duplex.
27.0	Define and explain the functions of bridges and switches. The student will be able to:

CTE Standards and Benchmarks	
	27.01 Define bridging and switching.
	27.02 Define and describe the content-addressable memory (CAM) table.
	27.03 Define latency.
	27.04 Describe store-and forward and cut-through switching modes.
	27.05 Explain Spanning-Tree Protocol (STP).
	27.06 Define collisions, broadcasts, collision domains, and broadcast domains.
	27.07 Identify the Layer 1, 2, and 3 devices used to create collision domains and broadcast domains.
	27.08 Discuss data flow and problems with broadcasts.
	27.09 Explain network segmentation and list the devices used to create segments.
28.0	Explain the mathematical concepts and protocols behind the internet. The student will be able to:
	28.01 Explain why the Internet was developed and how TCP/IP fits the design of the Internet.
	28.02 List the four layers of the TCP/IP model.
	28.03 Describe the functions of each layer of the TCP/IP model.
	28.04 Compare the OSI model and the TCP/IP model.
	28.05 Describe the function and structure of IP addresses.
	28.06 Understand why subnetting is necessary.
	28.07 Explain the difference between public and private addressing.
	28.08 Understand the function of reserved IP addresses.
	28.09 Explain the use of static and dynamic addressing for a device.
	28.10 Use ARP to obtain the MAC address to send a packet to another device.
	28.11 Understand the issues related to addressing between networks.
	28.12 Demonstrate proficiency with IPv6.
29.0	Define and explain the difference between routed and routing protocols. The student will be able to:
	29.01 Describe routed (routable) protocols.
	29.02 List the steps of data encapsulation in an internetwork as data is routed to one or more Layer 3 devices.
	29.03 Describe connectionless and connection-oriented delivery.

CTE Standards and Benchmarks	
	29.04 Name the IP packet fields.
	29.05 Describe process of routing.
	29.06 Compare and contrast different types of routing protocols.
	29.07 List and describe several metrics used by routing protocols.
	29.08 List several uses for subnetting.
	29.09 Determine the prefix/subnet mask for a given situation.
	29.10 Use a prefix/subnet mask to determine the subnet ID.
30.0	Recognize, define, and explain functions of the transport layer. The student will be able to:
	30.01 Describe the functions of the TCP/IP transport layer.
	30.02 Describe flow control.
	30.03 Describe the processes of establishing a connection between peer systems.
	30.04 Describe windowing.
	30.05 Describe acknowledgment.
	30.06 Identify and describe transport layer protocols.
	30.07 Describe TCP and UDP header formats.
	30.08 Describe TCP and UDP port numbers and ports used for services and clients.
	30.09 List the major protocols of the TCP/IP application layer.
	30.10 Provide a brief description of the features and operation of well-known TCP/IP applications.
	30.11 Describe TCP and UDP with its function.
	30.12 Describe TCP synchronization and flow control.
	30.13 Describe multiple conversations between hosts.
	30.14 Understand the differences and the relationship between MAC addresses, IP addresses, and port numbers.
31.0	Explain, define, and identify the components of a WAN and router. The student will be able to:
	31.01 Explain the difference between a WAN and LAN and the type of addresses each uses.
	31.02 Describe the role of a router in a WAN.
	31.03 Identify internal components of the router and describe their functions.

CTE Standards and Benchmarks	
	31.04 Describe the physical characteristics of the router.
	31.05 Identify common ports on a router.
	31.06 Properly connect FastEthernet, serial WAN, and console ports.
32.0	Describe and identify an operating system for a router. The student will be able to:
	32.01 Describe the purpose of the router operating system.
	32.02 Describe the basic operation of the router operating system.
	32.03 Identify various router operating system features.
	32.04 Identify the methods to establish a CLI session with the router.
	32.05 Establish a terminal emulation session on a router.
	32.06 Log into a router.
	32.07 Use the help feature in the command line interface.
	32.08 Troubleshoot command errors.
	32.09 Name a router.
	32.10 Set passwords.
	32.11 Explore router configuration commands.
	32.12 Configure router interface.
	32.13 Upgrade router operating system.
	32.14 Configure an interface description.
	32.15 Configure banner message.
	32.16 Understand the importance of version control.
	32.17 Save changes to a router.
33.0	Explain how to establish connections between neighboring routers. The student will be able to:
	33.01 Enable and disable protocols.
	33.02 Determine which neighboring devices are connected to which local interfaces.
	33.03 Establish, Verify, Disconnect, Suspend a Telnet connection.
	33.04 Perform alternative connectivity tests.

CTE Standards and Benchmarks	
	33.05 Troubleshoot remote terminal connections.
34.0	Identify and explain the router boot sequence and file system. The student will be able to:
	34.01 Identify the stages of the router boot sequence.
	34.02 Determine how a router locates and loads its operating system.
	34.03 Use the boot system command.
	34.04 Identify the configuration register values.
	34.05 Briefly describe the files used by the router operating system and their functions.
	34.06 List the locations on the router of the different file types.
	34.07 Save and restore configuration files using TFTP and copy-and paste.
	34.08 Load a router operating system image using TFTP.
	34.09 Verify the file system.
35.0	Identify and explain static and dynamic routing protocols. The student will be able to:
	35.01 Explain the significance of static routing.
	35.02 Configure static and default routes.
	35.03 Verify and troubleshoot static and default routes.
	35.04 Identify routing protocols.
	35.05 Identify distance vector routing protocols.
	35.06 Identify link-state routing protocols.
	35.07 Describe the basic characteristics of common routing protocols.
	35.08 Identify interior gateway protocols.
	35.09 Identify exterior gateway protocols BGP.
	35.10 Enable Routing Information Protocol (RIP) on a router.
36.0	Describe and configure distance vector protocols. The student will be able to:
	36.01 Describe how routing loops can occur in distance vector routing.
	36.02 Describe several methods used by distance vector routing protocols to ensure that routing information is accurate.
	36.03 Configure RIP.

CTE Standards and Benchmarks	
37.0	Perform tasks related to protocol troubleshooting. The student will be able to:
37.01	Describe ICMP.
37.02	Describe the ICMP message format and error message types.
37.03	Identify potential causes of specific ICMP error messages.
37.04	Describe ICMP control messages.
37.05	Identify a variety of ICMP control messages used in networks today.
37.06	Determine the causes for ICMP control messages.
38.0	Examine and test networks. The student will be able to:
38.01	Use the commands to gather detailed information about the routes installed on the router.
38.02	Configure a default route or default network.
38.03	Understand how a router uses both Layer 2 and Layer addressing to move data through the network.
39.0	Define, explain and describe access lists. The student will be able to:
39.01	Describe the differences between standard and extended ACLs.
39.02	Explain the rules for placement of ACLs.
39.03	Create and apply named ACLs.
39.04	Describe the function of firewalls.
39.05	Use ACLs to restrict virtual terminal access.
40.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
40.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
40.02	Employ critical thinking and interpersonal skills to resolve conflicts.
40.03	Identify and document workplace performance goals and monitor progress toward those goals.
40.04	Conduct technical research to gather information necessary for decision-making.
41.0	Use information technology tools. The student will be able to:
41.01	Use personal information management (PIM) applications to increase workplace efficiency.
41.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
41.03	Employ computer operations applications to access, create, manage, integrate, and store information.

CTE Standards and Benchmarks	
	41.04 Employ collaborative/groupware applications to facilitate group work.
42.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	42.01 Describe the nature and types of business organizations.
	42.02 Explain the effect of key organizational systems on performance and quality.
	42.03 List and describe quality control systems and/or practices common to the workplace.
	42.04 Explain the impact of the global economy on business organizations.
43.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	43.01 Evaluate and justify decisions based on ethical reasoning.
	43.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	43.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	43.04 Interpret and explain written organizational policies and procedures such as Sarbanes-Oxley, HIPPA, Gramm-Leach-Bliley.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 3, Infrastructure**
Course Number: **8207040**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes IT management skills, troubleshooting and diagnostic techniques; network design, devices, topographies, protocols and standards; email and Internet activities, network traffic control and security, and WAN vs. LAN technologies.

CTE Standards and Benchmarks	
44.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
44.01	Develop diplomatic methods to communicate with customers.
45.0	Participate in simulated work-based learning experiences. The student will be able to:
45.01	Participate in simulated work-based learning experiences in a network support services environment.
45.02	Discuss the use of technology in a network support services environment.
46.0	Provide network support and assistance by troubleshooting and diagnosing through direct contact remote access. The student will be able to:
46.01	Apply appropriate diagnostic techniques to solve network problems.
46.02	Perform local network support using various troubleshooting and diagnostic techniques.
46.03	Perform remote network support using various remote access methods.
47.0	Perform logical and physical network design activities. The student will be able to:
47.01	Describe the various LAN communication problems.
47.02	Describe the effects of LAN segmentation with bridges, routers, and switches.
47.03	Describe the operation, characteristics and benefits of VLANS.
47.04	Explain and identify LAN design goals, issues, and methodology.
47.05	Demonstrate the ability to analyze equipment necessary to meet specific design requirement.
47.06	Demonstrate the ability to create physical and logical network implementation documentation.
48.0	Demonstrate proficiency in selecting appropriate routing protocols and IP configuration for various network designs. The student will be able

CTE Standards and Benchmarks	
	to:
	48.01 Describe the two parts of network addressing, and then identify the parts in specific protocol address examples.
	48.02 Demonstrate proficiency with IP addresses.
	48.03 Configure IP addresses.
	48.04 Verify IP addresses.
	48.05 Identify the functions of the TCP/IP transport-layer protocols.
	48.06 Identify the functions of the TCP/IP network-layer protocols.
	48.07 Identify the functions performed by ICMP.
	48.08 Explain the services of separate and integrated multi-protocol routing.
	48.09 List problems that each routing type encounters when dealing with topology changes and describe techniques to reduce the number of these problems.
49.0	Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security. The student will be able to:
	49.01 Define and describe the purpose and operation of network traffic filtering.
	49.02 Demonstrate proficiency in using configuration and interface commands to perform and monitor network traffic filtering.
50.0	Perform network management activities related to documentation, security, performance, administration, troubleshooting and coping with environmental factors. The student will be able to:
	50.01 Perform documentation activities for networks, such as logs, journals, diagrams, labeling schemes, layouts, software listings, user policy, and security policy.
	50.02 Plan network security measures by establishing security policies and procedures, including user policies, authentication procedures, back-up and data recovery procedures, and redundancy techniques.
	50.03 Demonstrate proficiency in using network monitoring software.
	50.04 Explain the procedures necessary to monitor, create benchmarks, and plan for improvement of network performance.
	50.05 Explain the administrative side of network management, including physical and logical boundaries, costs, error report documentation and the management of human resources.
51.0	Identify and describe various WAN functions, devices, and demonstrate understanding of the WAN design process. The student will be able to:
	51.01 Describe the major features of WAN technology, including, devices, standards, encapsulation, link options, and packet and circuit switching.
	51.02 Perform WAN design activities that require using the necessary steps in WAN design, the three-layered design model, and various other design models.
52.0	Describe the operation and implementation of virtual private networks. The student will be able to:

CTE Standards and Benchmarks	
	52.01 Describe the virtual private network operation.
	52.02 Describe the virtual private network implementation.
	52.03 Demonstrate an understanding of tunneling.
	52.04 Describe secure VPN's.
53.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	53.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	53.02 Explain emergency procedures to follow in response to workplace accidents.
	53.03 Create a disaster and/or emergency response plan.
54.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	54.01 Employ leadership skills to accomplish organizational goals and objectives.
	54.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	54.03 Conduct and participate in meetings to accomplish work tasks.
	54.04 Employ mentoring skills to inspire and teach others.
55.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	55.01 Identify and demonstrate positive work behaviors needed to be employable.
	55.02 Develop personal career plan that includes goals, objectives, and strategies.
	55.03 Examine licensing, certification, and industry credentialing requirements.
	55.04 Maintain a career portfolio to document knowledge, skills, and experience.
	55.05 Evaluate and compare employment opportunities that match career goals.
	55.06 Identify and exhibit traits for retaining employment.
	55.07 Identify opportunities and research requirements for career advancement.
	55.08 Research the benefits of ongoing professional development.
	55.09 Examine and describe entrepreneurship opportunities as a career planning option.
56.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
	56.01 Identify and describe the services and legal responsibilities of financial institutions.
	56.02 Describe the effect of money management on personal and career goals.

CTE Standards and Benchmarks
56.03 Develop a personal budget and financial goals.
56.04 Complete financial instruments for making deposits and withdrawals.
56.05 Maintain financial records.
56.06 Read and reconcile financial statements.
56.07 Research, compare and contrast investment opportunities.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 4, Infrastructure**
Course Number: **8207050**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The student will learn to install, configure, and maintain large networks. Student will also be able to demonstrate proficiency in defining, configuring and trouble-shooting the following protocols: IP, EIGRP, Async Routing, Extended Access Lists, IP RIP, Route Redistribution, RIP, Route Summarization, OSPF, VLSM, BGP, Serial, Frame Relay, DSL, ISL, X.25, DDR, PSTN, PPP, VLANs, Ethernet, Access Lists, 802.10, FDDI, Transparent and Translational Bridging installation.

CTE Standards and Benchmarks	
57.0	Participate in simulated work-based learning experiences. The student will be able to:
57.01	Participate in simulated work-based learning experiences in a network support services environment.
57.02	Discuss the use of technology in a network support services environment.
58.0	Compare and contrast hierarchical network design models and scalable internetworks. The student will be able to:
58.01	Show proficiency in the use of the three-layer hierarchical design model.
58.02	Describe router functions in the core layer, distribution layer, and access layer.
58.03	Describe key characteristics of making the network reliable, available, responsive, efficient, adaptable, accessible, scalable and secure.
59.0	Discuss advanced IP addressing management. The student will be able to:
59.01	Describe and explain IPv4 addressing, Internet's address architecture, classes of IP addresses, and perform subnet masking.
59.02	Understand and explain Classless Interdomain Routing (CIDR), route aggregation, supernetting and address allocation.
59.03	Discuss and explain Variable-Length Subnet Masks along with classless and classful routing protocols.
59.04	Compare and contrast route summarization and route flapping.
59.05	Describe and discuss Network Address Translation (NAT), private addressing with NAT, private IP addresses (RFC 1918) and discontiguous subnets.
59.06	Describe the functions of private addressing and be able to explain the major features of and configure NAT, PAT, and DHCP.
59.07	Configure IOS DHCP server, Easy IP and IP helper addresses.
59.08	Discuss IP addressing crisis and solutions with IPv6 address formats.

CTE Standards and Benchmarks	
60.0	Demonstrate proficiency in basic router configuration. The student will be able to:
60.01	Configure VLSM using routing fundamentals.
60.02	Configure static routing and dynamic routing using distance-vector routing protocols, link-state routing protocols, and hybrid routing.
60.03	Configure static default routes and default routing with EIGRP using default route caveats and floating static routes.
60.04	Describe and explain convergence issues and route calculation fundamentals.
60.05	Start routing process using various configurations, initiate routing updates and routing metrics.
61.0	Demonstrate proficiency in the use of OSPF. The student will be able to:
61.01	Discuss issues addressed by the use OSPF, list and define OSPF terminology, list OSPF states and OSPF network types, describe OSPF Hello protocol and Steps of OSPF operation.
61.02	Establish router adjacencies, elect a DR and a BDR, and discover routes.
61.03	Select appropriate routes and maintain routing information, configuring OSPF on routers within a single area.
61.04	Use optional configuration commands and configure OSPF over NBMA in a lab setting.
61.05	Describe Full-Mesh Frame Relay, Partial-Mesh Frame Relay, Point-to-Multipoint OSPF.
62.0	Understand and discuss multi-area OSPF operation and configuration. The student will be able to:
62.01	Configure OSPF, examining the DR/BDR election process.
62.02	Configure Point-to-Multipoint OSPF over frame relay, create multiple OSPF areas, use OSPF router types, and incorporate OSPF LSA and area types.
62.03	Configuring OSPF operation across multiple areas and flooding LSUs to multiple areas, updating the routing table.
62.04	Configure Multi-area OSPF, using and configuring OSPF multi-area components, and configuring OSPF route summarization.
62.05	Verify OSPF operation, show commands, clear and debug commands.
63.0	Demonstrate the use of stub and totally stubby areas. The student will be able to:
63.01	Demonstrate understanding of stub and totally stubby areas.
63.02	Set up an OSPF stub area configuration example.
63.03	Monitor multi-area OSPF, verifying multi-area OSPF operation.
63.04	Create a multi-area OSPF.
64.0	Demonstrate proficiency in route optimization. The student will be able to:
64.01	Show how to control routing updates, policy routing, and route redistribution.
64.02	Create a route optimization configuration in lab setting.

CTE Standards and Benchmarks	
65.0	Demonstrate proficiency in the use of BGP. The student will be able to:
65.01	Define and explain autonomous systems and basic BGP operations.
65.02	Configure and monitor BGP operations and routing process.
65.03	Define and explain BGP attributes and the BGP decision process.
65.04	Create BGP configuration in lab setting.
65.05	Develop a scaling BGP and route reflectors.
65.06	Set up BGP route filtering and policy routing.
65.07	Explain the community attribute and peer groups.
65.08	Explain redundancy, symmetry, and load balancing.
65.09	Define and explain BGP redistribution.
65.10	Perform scaling BGP lab exercises and configure BGP in a lab setting.
66.0	Define and show proficiency in security. The student will be able to:
66.01	Show proficiency in securing router access using access lists.
66.02	Show proficiency in using dynamic access lists.
66.03	Show proficiency in session filtering.
66.04	Define and explain context-based access control.
66.05	Use an alternative to access lists.
66.06	Configure router security in a lab setting.
67.0	Using lab equipment, demonstrate the setup, configuration, and the connectivity of routers to create a small WAN. The student will be able to:
67.01	Demonstrate the use of remote access.
67.02	Select appropriate WAN technologies for different scenarios.
67.03	Select remote access solutions for different technologies.
67.04	Assemble and cable WAN components.
68.0	Configure and monitor DSL and DDR. The student will be able to:
68.01	Explain and discuss DSL architecture and DSL protocol layers.
68.02	Configure DSL, static routing and default routing, and DSL PRI.

CTE Standards and Benchmarks	
	68.03 Create optional configurations.
	68.04 Monitor the DSL interface.
	68.05 Create DSL configurations.
69.0	Demonstrate the use of scaling IP addresses with NAT. The student will be able to:
	69.01 Define and explain NAT concepts and terminology.
	69.02 Demonstrate proficiency in configuring, creating and verifying NAT configurations in lab setting.
70.0	Demonstrate proficiency using Authentication, Authorization and Accounting (AAA) to scale access control. The student will be able to:
	70.01 List and define AAA concepts and terminology.
	70.02 Demonstrate proficiency configuring AAA.
	70.03 Perform lab exercises using access control configurations.
71.0	Understand and describe key characteristics of various switching technologies, LAN switching and the hierarchical model of network design, and the 3-tier model. The student will be able to:
	71.01 Discuss the requirements of the evolving campus structure and the issues with traditional network designs.
	71.02 Describe the fundamental campus elements and contributing variables to campus networks.
	71.03 Compare and contrast the traditional 80/20 rule of network traffic and the new 20/80 rule of network traffic.
	71.04 Discuss switching and the OSI model, layer 2, 3, and 4 switching, and multilayer switching.
	71.05 Discuss the core layer, the distribution layer, and the access layer in relation to switching.
	71.06 List and describe the advantages and disadvantages of the building-block approach, scaling the switch block, building the core block and layer 2 and 3 backbone scaling.
72.0	Understand and describe campus networks, design models, and switching technologies. The student will be able to:
	72.01 List and explain key characteristics of various switching technologies.
	72.02 Discuss LAN switching and the hierarchical model of network design.
	72.03 Show proficiency using the 3-tier model to networking.
73.0	Show proficiency configuring a switch. The student will be able to:
	73.01 Demonstrate the process for initial connectivity to a switch.
	73.02 Show proficiency creating the basic configuration of a switch.
	73.03 List and explain important switch operating system features.
74.0	Demonstrate proficiency configuring VLANS. The student will be able to:

CTE Standards and Benchmarks	
	74.01 Understand and explain VLANs.
	74.02 Discuss VLAN basics and VLAN types.
	74.03 Configure a VLAN in a lab setting.
	74.04 Show use of VLAN identification techniques and VLAN trunking protocol.
	74.05 Create VTP configuration and use VTP pruning.
75.0	Understand and explain spanning tree protocol (STP) and redundant links. The student will be able to:
	75.01 Discuss Basic STP Operations and STP Processes.
	75.02 Compare and contrast VLANs and STP.
	75.03 Show how STP is used in the Campus Network.
	75.04 Demonstrate the resolution of Redundant Links.
76.0	Demonstrate proficiency with multilayer switching. The student will be able to:
	76.01 Define and explain MLS Processes.
	76.02 Create basic MLS configurations.
	76.03 Show proficiency using flow masks.
77.0	Demonstrate the use of hot standby routing protocol (HSRP). The student will be able to:
	77.01 Define and explain HSRP operations.
	77.02 Create HSRP configurations in a lab setting.
78.0	Understand and use IGMP and multicasting. The student will be able to:
	78.01 Define and explain multicasting.
	78.02 Understand and discuss IGMP.
	78.03 Show proficiency routing multicast traffic.
	78.04 Demonstrate proficiency using multicast routing protocols.
	78.05 Configure IP multicast routing in a lab setting.
	78.06 List and describe optional IP multicast routing tasks.
79.0	Demonstrate proficiency restricting network access. The student will be able to:
	79.01 Show proficiency creating networking policies.

CTE Standards and Benchmarks	
	79.02 Discuss and explain basic network security techniques.
	79.03 Demonstrate execution of policy configurations on a set of routers.
80.0	Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools. The student will be able to:
	80.01 Explain and discuss troubleshooting methodologies and general problem-solving concepts.
	80.02 List and define general considerations in troubleshooting.
	80.03 Define and explain each component of the general problem-solving model.
	80.04 Demonstrate proficiency using common management and diagnostic tools.
	80.05 Show proficiency using network management software.
	80.06 Demonstrate proficiency using router diagnostic commands.
	80.07 Familiarize logging and error message formats.
	80.08 Demonstrate proficiency interacting with technical support.
81.0	List and define the commonly used protocols, routing techniques, and switching processes. The student will be able to:
	81.01 List and define network services, layer 2 LAN protocols, and layer 2 WAN protocols.
	81.02 Trace packets through a router.
	81.03 Define and explain packet switching paths.
	81.04 Identify performance issues affecting packet switching.
	81.05 Define and explain low-level troubleshooting.
82.0	Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANS and frame relay. The student will be able to:
	82.01 List, define, and explain theory, concepts, and terminology of TCP/IP, LAN switch environment, spanning tree, VLANs and frame relay.
	82.02 List, define, and explain common problems with TCP/IP and LAN switching.
	82.03 List, define, and explain common scenarios with VLANs and frame relay.
	82.04 Troubleshoot TCP/IP in a Windows environment; use LAN switch troubleshooting tools, explain general VLAN troubleshooting issues; list and explain the steps in frame relay troubleshooting and DSL problem isolation.
	82.05 Use show commands to verify LAN switch configuration settings.
	82.06 Use show and debug commands for TCP/IP, router VLANs and frame relay.
	82.07 Use TCP/IP diagnostic tools.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 5**
Course Number: **8207060**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes wireless networking technologies, implementation, management and security.

CTE Standards and Benchmarks	
83.0	Participate in simulated work-based learning experiences. The student will be able to:
83.01	Participate in simulated work-based learning experiences in a network support services environment.
83.02	Discuss the use of technology in a network support services environment.
83.03	Discuss the management/supervisory skills needed in a network support service environment.
84.0	Demonstrate proficiency in applying radio frequency (RF) technologies. The student will be able to:
84.01	Define and apply the basic concepts of RF behavior.
84.02	Understand the applications of basic RF antenna concepts.
84.03	Understand and apply the basic components of RF.
84.04	Identify some of the different uses for spread spectrum technologies.
84.05	Comprehend the differences between, and apply the different types of spread spectrum technologies.
84.06	Identify and apply the concepts which make up the functionality of spread spectrum technology.
84.07	Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times.
85.0	Develop an awareness of wireless LAN technologies. The student will be able to:
85.01	Identify and apply the processes involved in authentication and association.
85.02	Recognize the concepts associated with wireless LAN service sets.
85.03	Understand the implications of the following power management features of wireless LANs.
85.04	Specify the modes of operation involved in the movement of data traffic across wireless LANs.
86.0	Perform implementation and management activities. The student will be able to:

CTE Standards and Benchmarks	
	86.01 Identify the technology roles for which wireless LAN technology is an appropriate technology application.
	86.02 Identify the purpose of infrastructure devices and explain how to install, configure, and manage them.
	86.03 Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them.
	86.04 Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them.
	86.05 Identify the basic attributes, purpose, and function of types of antennas.
	86.06 Describe the proper locations and methods for installing antennas.
	86.07 Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas.
	86.08 Identify the use of wireless LAN accessories and explain how to install, configure, and manage them.
	86.09 Identify, understand, correct or compensate for wireless LAN implementation challenges.
	86.10 Explain how antenna diversity compensates for multipath.
	86.11 Identify and understand the importance and process of conducting a thorough site survey.
	86.12 Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey.
	86.13 Identify the necessary equipment involved in performing a site survey.
	86.14 Understand the necessary procedures involved in performing a site survey.
	86.15 Identify and understand site survey reporting procedures.
87.0	Develop an awareness of wireless security systems. The student will be able to:
	87.01 Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques including the use of WVLAN's.
	87.02 Describe types of wireless LAN security attacks, and explain how to identify and prevent them.
	87.03 Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions.
	87.04 Explain the uses of corporate security policies and how they are used to secure a wireless LAN.
	87.05 Identify how and security precautions are used to secure a wireless LAN.
88.0	Demonstrate knowledge of wireless industry standards. The student will be able to:
	88.01 Identify, apply and comprehend the differences between wireless LAN standards.
	88.02 Understand the roles of organizations in providing direction and accountability within the wireless LAN industry.
	88.03 Identify the differences between the ISM and UNII bands.
	88.04 Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links.

Florida Department of Education
Student Performance Standards

Course Title: **Networking 6**
Course Number: **8207070**
Course Credit: **1**

Course Description:

This course continues the study of network support services. The content includes network security.

CTE Standards and Benchmarks	
89.0	Participate in simulated work-based learning experiences. The student will be able to:
89.01	Participate in simulated work-based learning experiences in a network support services environment.
89.02	Discuss the use of technology in a network support services environment.
89.03	Discuss the management/supervisors skills needed in a network support services environment.
90.0	Demonstrate a knowledge of general security concepts. The student will be able to:
90.01	Describe access control.
90.02	Describe network authentication.
90.03	Understand the various types of network attacks (backdoors, DOS, spoofing).
90.04	Identify and modify non-essential services and protocols.
90.05	Identify malicious code (virus, worm, Trojan).
90.06	Configure system auditing, logging, and scanning as it relates to security procedures.
91.0	Develop an awareness of communication security concepts. The student will be able to:
91.01	Describe remote access protocols (VPN, RADIUS, L2TP).
91.02	Identify E-mail security concerns (hoaxes, spam).
91.03	Identify web (HTML) security concepts and designs (HTTP/S, IM).
91.04	Demonstrate an awareness of file transfer security concerns.
91.05	Describe and identify wireless networking security concerns and vulnerabilities.
92.0	Develop an awareness of network infrastructure security. The student will be able to:
92.01	Install and configure network firewalls.

CTE Standards and Benchmarks	
	92.02 Identify security concerns with various wiring media (copper, fiber).
	92.03 Identify security concerns associated with removable media and storage devices.
	92.04 Demonstrate an awareness of security topologies (security zones, Intranets, NAT).
	92.05 Configure and use intrusion detection software.
	92.06 Establish security baselines (updates, patches, hot fixes, Access Control lists).
	92.07 Demonstrate the ability to configure a Virtual Private Network (VPN).
	92.08 Describe the function of Network Address Translation (NAT).
93.0	Develop an awareness of cryptography and its relation to security. The student will be able to:
	93.01 Demonstrate an understanding of security algorithms and encryption.
	93.02 Use and apply Public Key Certificates.
	93.03 Demonstrate an understanding of standards and protocols in commerce.
94.0	Incorporate organizational and operational security in an appropriate and effective manner. The student will be able to:
	94.01 Describe how to establish a network security policy.
	94.02 Explain the importance of physical security to protect network resources.
	94.03 Identify and use disaster recovery procedures.
	94.04 Describe the importance of business continuity and its relationship to network and corporate security.
	94.05 Describe security policies and procedures that would be used in a business environment.
	94.06 Explain the importance of privilege management (access, password management, sign-on).
	94.07 Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches).
	94.08 Explain the importance of educating users and supervisors in regard to network security.
	94.09 Create documentation that describes standards and guidelines for a network security system.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Game/Simulation/Animation Visual Design**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8208100
CIP Number	0550041121
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 27-1014 – Multimedia Artists and Animators
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of project-based courses that provide coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster such as Game or Simulation Designer, Game or Simulation Graphic Artist, and Game or Simulation 3-D Animator; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, 2D/3D animation design and production, and implementation issues. Specialized skills involving graphic animation software are used to produce a variety of two and three dimensional components.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1 Options	8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1199	2	CT
	8208110	Game & Simulation Foundations	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @7 7G DIGI MEDIA 7G COMP PROG 7G	1 credit		2	CT
Course 2	8208120	Game & Simulation Design		1 credit		2	CT
Course 3	8208130	Game & Simulation Graphic Artist		1 credit	27-1014	2	CT
Course 4	8208140	Game & Simulation 3D Animator		1 credit	27-1014	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Program Recommendations

The Game, Simulation and Animation Visual Design program lends itself to integration of the core academic subjects of language arts, math, science, visual arts, and social studies into project activities. It is through a balanced and integrated curriculum that students attain the attitudes, skills, and knowledge needed to compete successfully in today's work force. To achieve total curriculum integration, academic and career and technical education teachers should be scheduled with common planning times.

This program emphasizes the development of technical abilities as well as ethical and societal awareness necessary to function in a highly technological society. The use of cooperative learning groups is recommended. By learning and practicing group process skills, students will be prepared to work "together" in real work situations. Program graduates will develop enhanced self-esteem as well as the problem solving and teamwork skills necessary to succeed in careers and postsecondary education.

The Game, Simulation & Animation Visual Design program places a strong emphasis on workplace learning. Job shadowing and mentoring experiences with game and simulation professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.

The Foundations and Design courses should be taken in sequence prior to the 2D Graphic Development and 3D Graphic Animation courses. The

2D Graphic Development and 3D Graphic Animation courses may be taken concurrently. Digital Business Foundations may be taken concurrently with either the Foundations course or the Design course.

The Game/Simulation/Animation Advanced Applications program (8208400) is an appropriate follow-on capstone program.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Identify commonly used art and animation production tools in the game design industry.
11.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
12.0 Explain the importance of employability skill and entrepreneurship skills as it relates to game/simulation development.
13.0 Identify tools and software commonly used in game development.
14.0 Investigate career opportunities in the game industry.
15.0 Demonstrate research and information fluency.
16.0 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
17.0 Explore the methods used to create and sustain player immersion.
18.0 Describe the game development life cycle.
19.0 Demonstrate the professional level of written and oral communication required in the game development industry.
20.0 Understand the core tasks and challenges that face a video game design team.
21.0 Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives.
22.0 Create a working game or simulation as part of a team.
23.0 Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game.
24.0 Categorize the different gaming genres.
25.0 Identify popular games and identify commonality between them.
26.0 Understand the general procedure and requirements of game design.
27.0 Understand the general principles of storytelling for game design.
28.0 Understand character archetypes and character design.
29.0 Develop a game design document.
30.0 Understand the process of creating and designing player choice and other game designer strategy considerations.
31.0 Create and design the game flow as it relates to story and plot.
32.0 Assess common principles and procedures in game flow design.

33.0 Describe player challenge rule creation elements.
34.0 Understand the use of inventory systems in game design.
35.0 Understand the various job titles and responsibilities of a graphic artist as it relates to the game industry.
36.0 Develop the art direction for a game.
37.0 Determine and document the graphical needs of a game using design documents including art direction and reference materials.
38.0 Understand the fundamentals of drawing and painting techniques.
39.0 Demonstrate a working knowledge of vector and paint programs used to make graphics.
40.0 Demonstrate the effective use art input devices.
41.0 Demonstrate world building, making graphics and backgrounds for side scrolling, top down, and Isometric projection.
42.0 Understand the general concepts of environmental design.
43.0 Describe how environmental design is used in conjunction with game level design.
44.0 Demonstrate knowledge of basic lighting.
45.0 Demonstrate knowledge of basic materials and textures.
46.0 Demonstrate basic understanding of modeling principles.
47.0 Demonstrate knowledge of polygon modeling.
48.0 Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling.
49.0 Demonstrate advance texturing techniques.
50.0 Understand the various job titles and responsibilities of a 3D animator as it relates to the game industry.
51.0 Understand the principles of 2D and 3D animation as it relates to game graphics (walk, run, jump, idle).
52.0 Demonstrate a working knowledge of modeling and paint programs used to make 3D graphics and animation.
53.0 Demonstrate knowledge of basic animation.
54.0 Demonstrate knowledge of rigging.
55.0 Understand the fundamentals of facial animation.
56.0 Create a user interface.
57.0 Create visual effects.
58.0 Create particle system effects.
59.0 Individually design and create a playable game.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: Game & Simulation Foundations
Course Number: 8208110
Course Credit: 1

Course Description:

This course is designed to provide an introduction to game and simulation concepts and careers, the impact game and simulation has on society and industry, and basic game/simulation design concepts such as rule design, play mechanics, and media integration. This course compares and contrasts games and simulations, key development methodologies and tools, careers, and industry-related information. This course also covers strategies, processes, and methods for conceptualizing a game or simulation application; storyboarding techniques; and development tools.

Hands-on activities using an entry-level game development tool should be integrated into the curriculum.

Game & Simulation Creation
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

CTE Standards and Benchmarks	
10.0	Identify commonly used art and animation production tools in the game design industry. The student will be able to:
10.01	Identify, categorize and discuss art and animation tools commonly used in game design.
11.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
11.01	Understand the use of “Fair Use and Fair Dealing”.
11.02	Understand the transfer and licensing of creative works.
11.03	Understand the use of “exclusive rights” to intellectual creations.
11.04	Demonstrate the use of digital watermarking.
12.0	Explain the importance of employability skill and entrepreneurship skills as it relates to game/simulation development. The student will be able to:
12.01	Identify and demonstrate positive work behaviors needed to be employable.
12.02	Maintain a career portfolio to document knowledge, skills, and experience.
12.03	Evaluate and compare employment opportunities that match career goals.
12.04	Identify and exhibit traits for retaining employment.

CTE Standards and Benchmarks	
13.0	Identify tools and software commonly used in game development. The student will be able to:
13.01	Identify and discuss the popular game development tools currently used in the industry.
13.02	Identify and discuss popular gaming engines.
13.03	Identify and discuss popular world building tools.
14.0	Investigate career opportunities in the game industry. The student will be able to:
14.01	Describe job requirements for a variety of occupations within the game development industry.
14.02	Identify current employment trends and career opportunities in the game industry.
15.0	Demonstrate research and information fluency. The student will be able to:
15.01	Play games to research and collect game play data.
15.02	Evaluate, analyze and document game styles and playability.
15.03	Determine the dramatic elements in games, including kinds of fun, player types and nonlinear storytelling.
16.0	Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design. The student will be able to:
16.01	Test and analyze games to determine the quality of rules, interfaces, navigation, performance, play, artistry and longevity in design and structure.
16.02	Research and evaluate the game analysis techniques used by the video game industry.
16.03	Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
16.04	Evaluate professional reviews and write a critical analysis of a current video game.
17.0	Explore the methods used to create and sustain player immersion. The student will be able to:
17.01	Research and define the term “player immersion”.
17.02	Explore and explain the factors that create player immersion in a game.
17.03	Examine popular games and explain the methods each game uses to increase player immersion.
18.0	Describe the game development life cycle. The student will be able to:
18.01	Identify steps in the pre-production process including the proof of concept and market research.
18.02	Describe the iterative prototyping process – Alpha, Beta, RTM.
18.03	Determine platform, technology and scripting requirements.
18.04	Implement techniques of scenario development, levels, and missions.
18.05	Discuss game testing requirements and methods.

CTE Standards and Benchmarks	
	18.06 Identify and describe maintenance, upgrade and sequel issues.
19.0	Demonstrate the professional level of written and oral communication required in the game development industry. The student will be able to:
	19.01 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
	19.02 Organize ideas and communicate oral and written messages appropriate for the game development industry environment.
20.0	Understand the core tasks and challenges that face a video game design team. The student will be able to:
	20.01 Identify and define the roles and responsibilities of team members on a video game design team.
	20.02 Explore and discuss methods of communications and scheduling for design teams.
21.0	Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives. The student will be able to:
	21.01 Employ leadership skills to accomplish organizational goals and objectives.
	21.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	21.03 Conduct and participate in meetings to accomplish work tasks.
	21.04 Employ mentoring skills to inspire and teach others.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Design**
Course Number: **8208120**
Course Credit: **1**

Course Description:

This course covers fundamental principles of designing a game or a simulation application, rules and strategies of play, conditional branching, design and development constraints, use of sound and animation, design tools, and implementation issues. The content includes market research, product design documentation, storyboarding, proposal development, and presentation of a project report. Emphasis is placed on the techniques needed to develop well-documented, structured game or simulation programs. Extensive use is made of evaluating and analyzing existing games or simulations.

Hands-on activities using an entry-level game development tool should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the creation and presentation of a playable game with design documentation.**

Game/Simulation Project
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

CTE Standards and Benchmarks	
22.0	Create a working game or simulation as part of a team. The student will be able to:
22.01	Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
22.02	Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
22.03	Using a simple game development tool, create a game or simulation.
22.04	Present the game or simulation.
23.0	Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game. The student will be able to:
23.01	Use industry standard game design production documents to create a game design production plan.
24.0	Categorize the different gaming genres. The student will be able to:
24.01	Research, compare and categorize the different gaming genres.
24.02	Analyze examples of different gaming genres.

CTE Standards and Benchmarks	
	24.03 Define and use the necessary vocabulary related to gaming and the different genres.
25.0	Identify popular games and identify commonality between them. The student will be able to:
	25.01 Analyze and deconstruct game environments and interactions.
	25.02 Compare and contrast the top selling video games in terms of player interaction, plot complexity, and reward.
	25.03 Categorize gameplay elements by player type (killer, talker, explorer and achiever).
26.0	Understand the general procedure and requirements of game design. The student will be able to:
	26.01 Describe the design process from conception to production.
	26.02 Explain the iterative nature of game design through the different stages of design iterations including pre-alpha, alpha, beta, release candidate, going gold and support.
	26.03 Develop design plans, for example, character sketches, documentation and storyboards for proposed games.
27.0	Understand the general principles of storytelling for game design. The student will be able to:
	27.01 Identify the essential elements of a story.
	27.02 Describe how creative writing is used as a game design tool.
	27.03 Compare and contrast methods of delivering a story in a game.
28.0	Understand character archetypes and character design. The student will be able to:
	28.01 Research and identify common character archetypes used in computer games.
	28.02 Design character prototypes to physically match archetype.
	28.03 Create character backstory and profile.
29.0	Develop a game design document. The student will be able to:
	29.01 Create a game strategy overview, character overview, and storyboard overview.
	29.02 Define the rules of play and multi-player options.
	29.03 Define strategic positioning of game immersion dynamics and psychological effect.
	29.04 Describe how game layout charts are used in game design.
	29.05 Understand the use of storyboards in the game design industry with regard to environmental illustrations, level designs, character designs, model sheets and GUI designs.
30.0	Understand the process of creating and designing player choice and other game designer strategy considerations. The student will be able to:
	30.01 Describe the use of artificial intelligence challenges in game design and the need for giving the player rest time between challenges.
	30.02 Evaluate the impact of randomness in game design especially as it pertains to pattern recognition.

CTE Standards and Benchmarks	
	30.03 Identify techniques used in the industry to help the player to navigate.
	30.04 Discuss the principles of player-centric design.
	30.05 Examine and discuss design elements that encourage continuous active engagement both mental and physical.
	30.06 Analyze design elements that maintain player interest and vary the degree of challenge.
	30.07 Discuss the need for a balance of design elements for the purpose of rewarding and frustrating players.
31.0	Create and design the game flow as it relates to story and plot. The student will be able to:
	31.01 Identify techniques of introducing the story plot and beginning play.
	31.02 Describe story plot development techniques for the middle of play in game design.
	31.03 Analyze and discuss planning techniques for climax and finale of games.
32.0	Assess common principles and procedures in game flow design. The student will be able to:
	32.01 Assess missions and scenarios game flow techniques.
	32.02 Describe common use of mission design and campaigns.
	32.03 Evaluate usage of static versus dynamic campaigns.
33.0	Describe player challenge rule creation elements. The student will be able to:
	33.01 Research common design methods for clearing obstacles or series of obstacles.
	33.02 Describe common design elements introducing skill, luck and combinations including escalating challenges to games.
	33.03 Identify common design elements used to vary weapons, characters and tools.
	33.04 Discuss the incorporation of risk reward and adaptive challenges (AI).
34.0	Understand the use of inventory systems in game design. The student will be able to:
	34.01 Discuss the various methods of describing items in player’s inventory in contemporary game design.
	34.02 Review and discuss industry methods of communicating how inventory items can have an effect on game play.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Graphic Artist**
Course Number: **8208130**
Course Credit: **1**

Course Description:

This course is focused on students acquiring skills to create, refine, and integrate realistic 2D graphics into a game or simulation product. Students will essentially learn how to use a graphic software package, file maintenance strategies, and migration techniques and issues.

CTE Standards and Benchmarks	
35.0	Understand the various job titles and responsibilities of a graphic artist as it relates to the game industry. The student will be able to:
35.01	Identify the job titles of graphic artist used in a game project.
35.02	Demonstrate the ability to work as part of an art team.
35.03	Perform one or more of the following roles for a game project: concept artist, art director, texture artist, environment artist.
36.0	Develop the art direction for a game. The student will be able to:
36.01	Develop a vision for visual elements of a game.
36.02	Create conceptual game art using various techniques, emphasizing space and form through range of value, placement, reflections, and shadows.
36.03	Create character sketches, architectural sketches and background sketches.
36.04	Understand the challenges of art direction as it relates to mobile devices.
37.0	Determine and document the graphical needs of a game using design documents including art direction and reference materials. The student will be able to:
37.01	Develop characters and game elements in respect to the art direction laid out in the design documents.
37.02	Determine the appropriate file format between vector based (resolution independent) vs. rasterized graphics (resolution dependent).
37.03	Understand the different aspects of quality and detail in relation to performance and size.
37.04	Understand the role of naming conventions as it applies to creative assets storage used in the work flow.
37.05	Demonstrate the effective use of alternative resolutions, scaling and file formats.
38.0	Understand the fundamentals of drawing and painting techniques. The student will be able to:
38.01	Demonstrate the use of different techniques, format, media or style.

CTE Standards and Benchmarks	
	38.02 Understand the use of primitives.
	38.03 Demonstrate basic understanding of composition of a scene.
	38.04 Understand the shape of the human form.
	38.05 Know the value of lights and shadows.
39.0	Demonstrate a working knowledge of vector and paint programs used to make graphics. The student will be able to:
	39.01 Know the difference between Vectors and Bitmaps.
	39.02 Demonstrate understanding of various graphic art programs.
	39.03 Utilize the programs tools and brushes.
	39.04 Know the importance of Layers.
	39.05 Identify file formats.
40.0	Demonstrate the effective use of art input devices. The student will be able to:
	40.01 Demonstrate the use of a digital tablet within a paint software application.
	40.02 Demonstrate the process of capturing textures using a digital camera.
	40.03 Demonstrate the process of importing images from a digital camera into a photo editing software application.
41.0	Demonstrate world building, making graphics and backgrounds for side scrolling, top down, and Isometric projection. The student will be able to:
	41.01 Know the importance of scale in relation to the player.
	41.02 Understand level design to successfully lead the player.
	41.03 Effectively use graphics to convey mood and story in the game world.
42.0	Understand the general concepts of environmental design. The student will be able to:
	42.01 Survey and evaluate commonly used concept art.
	42.02 Create a world sketch with particular attention to maintaining continuity of style.
	42.03 Describe the emotional/psychological aspects of environmental design that signify mood, façade of freedom, and resource struggling.
43.0	Describe how environmental design is used in conjunction with game level design. The student will be able to:
	43.01 Examine and evaluate examples of focus on a theme.
	43.02 Describe methods of creating a purposeful architecture giving consideration to continuity and themes and taking advantage of revisiting.
	43.03 Consider and discuss environmental design elements for multi-player or single player games.

CTE Standards and Benchmarks	
	43.04 Describe the history of creating shifts in game design environments and embracing novel ideas.
	43.05 Identify and discuss environmental design pitfalls such as red herrings and cookie-cutter layouts.
44.0	Demonstrate knowledge of basic lighting. The student will be able to:
	44.01 Demonstrate an understanding of 3 point lighting (key, fill, back).
	44.02 Demonstrate an understanding of low-key and high-key lighting.
45.0	Demonstrate knowledge of basic materials and textures. The student will be able to:
	45.01 Demonstrate an understanding of material and texture storage.
	45.02 Apply textures to an object.
	45.03 Demonstrate an understanding of procedural shaders.
	45.04 Demonstrate an understanding of channels.
	45.05 Adjust the transparency, luminance, and reflection of a material.
	45.06 Demonstrate an understanding of displacement maps.
	45.07 Demonstrate an understanding of bump maps.
	45.08 Demonstrate an understanding of UV mapping.
	45.09 Demonstrate an understanding of 3D painting.
46.0	Demonstrate basic understanding of modeling principles. The student will be able to:
	46.01 Demonstrate an understanding of primitives and parametric modeling.
	46.02 Demonstrate an understanding of non-uniform rational basis spline (NURBS), splines, and polygonal modeling.
	46.03 Demonstrate the ability to use reference images and files while modeling.
47.0	Demonstrate knowledge of polygon modeling. The student will be able to:
	47.01 Demonstrate an understanding of N-gons.
	47.02 Demonstrate an understanding of subdivision.
	47.03 Demonstrate basic polygon editing and manipulation.
	47.04 Demonstrate an understanding of cutting/division tools.
	47.05 Demonstrate an understanding of extrudes.
	47.06 Demonstrate an understanding of symmetry.

CTE Standards and Benchmarks	
	47.07 Demonstrate an understanding of basic deformers (bend, twist, melt).
48.0	Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling. The student will be able to:
	48.01 Demonstrate an understanding of points, vertices, edges, and polygons.
	48.02 Demonstrate an understanding of poly-count.
	48.03 Demonstrate an understanding of primitives.
	48.04 Locate an object's properties, attributes, and coordinates.
	48.05 Demonstrate understanding of Non uniform rational b-splines (NURBS).
	48.06 Demonstrate understanding of splines and generators (extrude, lathe, sweep).
	48.07 Understand the use of hierarchy.
	48.08 Demonstrate an understanding of Boolean objects.
	48.09 Demonstrate an understanding of Null objects.
49.0	Demonstrate advanced texturing techniques. The student will be able to:
	49.01 Create texture maps for objects in games.
	49.02 Develop 3D texture mapped objects.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation 3D Graphic Animator**
Course Number: **8208140**
Course Credit: **1**

Course Description:

This course is focused on students acquiring skills to create, refine, and integrate realistic 3D graphics into a game or simulation product. Students will essentially learn how to use a 3D animation software package, file maintenance conventions, and migration techniques and issues.

CTE Standards and Benchmarks	
50.0	Understand the various job titles and responsibilities of a 3D animator as it relates to the game industry. The student will be able to:
50.01	Identify the job titles of a 3D animator used in a game project.
50.02	Demonstrate the ability to work as part of an animation team.
50.03	Perform one or more of the following roles for a game project: animator, rigger, vfx artist.
51.0	Understand the principles of 2D and 3D animation as it relates to game graphics (walk, run, jump, idle). The student will be able to:
51.01	Demonstrate the ability to create character and object views from which to animate.
51.02	Break down animation into a series of pictures to import into a game engine.
51.03	Demonstrate an understanding of the value of timing to convey character motion.
51.04	Demonstrate the effective use of animation arcs for the articulation of body elements.
51.05	Demonstrate the use of principles of animation such as anticipation, squash, stretch, weight, exaggeration and overlapping & secondary motion.
51.06	Understand the use of motion capture techniques and acting principles.
52.0	Demonstrate a working knowledge of modeling and paint programs used to make 3D graphics and animation. The student will be able to:
52.01	Understand the limitation of bitmaps images.
52.02	Understand the use and application of bump map, normal and displacement images applied to a model.
52.03	Demonstrate understanding of various digital content creation tools.
52.04	Utilize the programs tools and brushes.
52.05	Know the importance of layers.
52.06	Identify file formats.

CTE Standards and Benchmarks	
	52.07 Create simple shapes and structures that can be exported to games or game editors.
53.0	Demonstrate knowledge of basic animation. The student will be able to:
	53.01 Apply animation principles to object animation.
	53.02 Demonstrate an understanding of animation timelines.
	53.03 Demonstrate an understanding of key framing.
	53.04 Demonstrate an understanding in the use of controllers.
54.0	Demonstrate knowledge of rigging. The student will be able to:
	54.01 Define rigging as a process.
	54.02 Compare and contrast rigging approaches and styles.
	54.03 Demonstrate an understanding of the rig as it relates to the model.
	54.04 Demonstrate an understanding of skeletal systems.
55.0	Understand the fundamentals of facial animation. The student will be able to:
	55.01 Understand facial land marking.
	55.02 Demonstrate the ability to show emotions through the eyes.
	55.03 Demonstrate the use of motion capture data as it applies to facial animation.
56.0	Create a user interface. The student will be able to:
	56.01 Understand good menu flow of the user interface.
	56.02 Design the ideal HUD (Heads Up Display).
57.0	Create visual effects. The student will be able to:
	57.01 Understand particle design for fire and smoke.
	57.02 Create water spray using 2D particles.
	57.03 Know the anatomy of an explosion effect.
	57.04 Create a 3D feel in a 2D world using light and shadows.
58.0	Create particle system effects. The student will be able to:
	58.01 Understand particle design for fire and smoke.
	58.02 Create water spray using 3D particles.

CTE Standards and Benchmarks	
	58.03 Know the aspects of an explosion effect.
59.0	Individually design and create a playable game. The student will be able to:
	59.01 Use a number of computer tools to enhance and ease game programming and artistry.
	59.02 Use a game engine to create a playable game.
	59.03 Use animated objects.
	59.04 Integrate sound and music to enhance the game experience.
	59.05 Test and debug to game completion.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Game/Simulation/Animation Audio/Video Effects**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8208200
CIP Number	0550041119
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 27-1014 – Multimedia Artists and Animators
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Game/Simulation Designer, Digital Media Artist, and Digital Media Specialist in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, audio/sound effects design and production, video/special effects design and production, and implementation issues. Specialized skills involving audio and video editing equipment and software are used to produce a variety of intrinsic and special audio/video effects.

This program is project-based and focuses on broad, transferable skills and stresses understanding and demonstration of the following rudiments of

the game and simulation industry: production planning, elements of production design, storyboarding, elements of visual design, integration of digital audio and digital video into new game/simulation productions, and collaboration/teamwork.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1 Options	8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
	8208110	Game & Simulation Foundations	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @7 7G DIGI MEDIA 7G COMP PROG 7G	1 credit	15-1199	2	CT
Course 2	8208120	Game & Simulation Design		1 credit	15-1199	2	CT
Course 3	8208230	Game & Simulation Audio/Sound Effects		1 credit	27-1014	2	CT
Course 4	8208240	Game & Simulation Video/Special Effects		1 credit	27-1014	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Program Recommendations

The Game/Simulation/Animation Audio/Video Effects program lends itself to integration of the core academic subjects of language arts, math, science, visual arts, and social studies into project activities. It is through a balanced and integrated curriculum that students attain the attitudes, skills, and knowledge needed to compete successfully in today's work force. To achieve total curriculum integration, academic and career and technical education teachers should be scheduled with common planning times.

This program emphasizes the development of technical abilities as well as ethical and societal awareness necessary to function in a highly technological society. The use of cooperative learning groups is recommended. By learning and practicing group process skills, students will be prepared to work "together" in real work situations. Program graduates will develop enhanced self-esteem as well as the problem solving and teamwork skills necessary to succeed in careers and postsecondary education.

The Game/Simulation/Animation Advanced Applications program (8208400) is an appropriate follow-on capstone program.

The Game/Simulation/Animation Audio/Video Effects program places a strong emphasis on workplace learning. Job shadowing and mentoring experiences with game and simulation professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.

10.0 Identify commonly used art and animation production tools in the game design industry.
11.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
12.0 Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development.
13.0 Identify tools and software commonly used in game development.
14.0 Investigate career opportunities in the game industry.
15.0 Demonstrate research and information fluency.
16.0 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
17.0 Explore the methods used to create and sustain player immersion.
18.0 Describe the game development life cycle.
19.0 Demonstrate the professional level of written and oral communication required in the game development industry.
20.0 Understand the core tasks and challenges that face a video game design team.
21.0 Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives.
22.0 Create a working game or simulation as part of a team.
23.0 Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game.
24.0 Categorize the different gaming genres.
25.0 Identify popular games and identify commonality between them.
26.0 Understand the general procedure and requirements of game design.
27.0 Understand the general principles of storytelling for game design.
28.0 Understand character archetypes and character design.
29.0 Develop a game design document.
30.0 Understand the process of creating and designing player choice and other game designer strategy considerations.
31.0 Create and design the game flow as it relates to story and plot.

32.0 Assess common principles and procedures in game flow design.
33.0 Describe player challenge rule creation elements.
34.0 Understand the use of inventory systems in game design.
35.0 Understand the history of audio/sound effects in the entertainment industry.
36.0 Perform various job roles typical for an audio technician on a game/simulation project.
37.0 Understand intellectual property rights, copyright laws, and plagiarism as they apply to creative assets.
38.0 Demonstrate a knowledge of production writing as it relates to game and simulation design.
39.0 Demonstrate appropriate voice acting skills.
40.0 Demonstrate basic audio production.
41.0 Set-up and configure a computer for audio applications.
42.0 Operate an audio workstation.
43.0 Demonstrate application of MIDI in a game/simulation project.
44.0 Incorporate audio assets into game/simulation engine.
45.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
46.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
47.0 Explain the importance of employability skill and entrepreneurship skills.
48.0 Demonstrate personal money management concepts, procedures, and strategies.
49.0 Understand the history of video effects in the entertainment.
50.0 Understand the various job titles and responsibilities video technician as it relates to game and simulation design.
51.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
52.0 Demonstrate a knowledge of production writing as it relates to game and simulation design.
53.0 Demonstrate appropriate acting skills.
54.0 Demonstrate basic video production.
55.0 Demonstrate set-up and configuration of a computer for video applications.
56.0 Demonstrate the basic operation of a video workstation.
57.0 Incorporate video assets into game/simulation engine.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Foundations**
Course Number: **8208110**
Course Credit: **1**

Course Description:

This course is designed to provide an introduction to game and simulation concepts and careers, the impact game and simulation has on society and industry, and basic game/simulation design concepts such as rule design, play mechanics, and media integration. This course compares and contrasts games and simulations, key development methodologies and tools, careers, and industry-related information. This course also covers strategies, processes, and methods for conceptualizing a game or simulation application; storyboarding techniques; and development tools.

Hands-on activities using an entry-level game development tool should be integrated into the curriculum.

Game & Simulation Creation
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

CTE Standards and Benchmarks	
10.0	Identify commonly used art and animation production tools in the game design industry. The student will be able to:
10.01	Identify, categorize and discuss art and animation tools commonly used in game design.
11.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
11.01	Understand the use of “Fair Use and Fair Dealing”.
11.02	Understand the transfer and licensing of creative works.
11.03	Understand the use of “exclusive rights” to intellectual creations.
11.04	Demonstrate the use of digital watermarking.
12.0	Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development. The student will be able to:
12.01	Identify and demonstrate positive work behaviors needed to be employable.
12.02	Maintain a career portfolio to document knowledge, skills, and experience.
12.03	Evaluate and compare employment opportunities that match career goals.
12.04	Identify and exhibit traits for retaining employment.

CTE Standards and Benchmarks	
13.0	Identify tools and software commonly used in game development. The student will be able to:
13.01	Identify and discuss the popular game development tools currently used in the industry.
13.02	Identify and discuss popular gaming engines.
13.03	Identify and discuss popular world building tools.
14.0	Investigate career opportunities in the game industry. The student will be able to:
14.01	Describe job requirements for a variety of occupations within the game development industry.
14.02	Identify current employment trends and career opportunities in the game industry.
15.0	Demonstrate research and information fluency. The student will be able to:
15.01	Play games to research and collect game play data.
15.02	Evaluate, analyze and document game styles and playability.
15.03	Determine the dramatic elements in games, including kinds of fun, player types and nonlinear storytelling.
16.0	Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design. The student will be able to:
16.01	Test and analyze games to determine the quality of rules, interfaces, navigation, performance, play, artistry and longevity in design and structure.
16.02	Research and evaluate the game analysis techniques used by the video game industry.
16.03	Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
16.04	Evaluate professional reviews and write a critical analysis of a current video game.
17.0	Explore the methods used to create and sustain player immersion. The student will be able to:
17.01	Research and define the term “player immersion”.
17.02	Explore and explain the factors that create player immersion in a game.
17.03	Examine popular games and explain the methods each game uses to increase player immersion.
18.0	Describe the game development life cycle. The student will be able to:
18.01	Identify steps in the pre-production process including the proof of concept and market research.
18.02	Describe the iterative prototyping process – Alpha, Beta, RTM.
18.03	Determine platform, technology and scripting requirements.
18.04	Implement techniques of scenario development, levels, and missions.
18.05	Discuss game testing requirements and methods.

CTE Standards and Benchmarks	
	18.06 Identify and describe maintenance, upgrade and sequel issues.
19.0	Demonstrate the professional level of written and oral communication required in the game development industry. The student will be able to:
	19.01 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
	19.02 Organize ideas and communicate oral and written messages appropriate for the game development industry environment.
20.0	Understand the core tasks and challenges that face a video game design team. The student will be able to:
	20.01 Identify and define the roles and responsibilities of team members on a video game design team.
	20.02 Explore and discuss methods of communications and scheduling for design teams.
21.0	Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives. The student will be able to:
	21.01 Employ leadership skills to accomplish organizational goals and objectives.
	21.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	21.03 Conduct and participate in meetings to accomplish work tasks.
	21.04 Employ mentoring skills to inspire and teach others.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Design**
Course Number: **8208120**
Course Credit: **1**

Course Description:

This course covers fundamental principles of designing a game or a simulation application, rules and strategies of play, conditional branching, design and development constraints, use of sound and animation, design tools, and implementation issues. The content includes market research, product design documentation, storyboarding, proposal development, and presentation of a project report. Emphasis is placed on the techniques needed to develop well-documented, structured game or simulation programs. Extensive use is made of evaluating and analyzing existing games or simulations.

Hands-on activities using an entry-level game development tool should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the creation and presentation of a playable game with design documentation.**

Game/Simulation Project
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

CTE Standards and Benchmarks	
22.0	Create a working game or simulation as part of a team. The student will be able to:
22.01	Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
22.02	Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
22.03	Using a simple game development tool, create a game or simulation.
22.04	Present the game or simulation.
23.0	Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game. The student will be able to:
23.01	Use industry standard game design production documents to create a game design production plan.
24.0	Categorize the different gaming genres. The student will be able to:
24.01	Research, compare and categorize the different gaming genres.
24.02	Analyze examples of different gaming genres.

CTE Standards and Benchmarks	
	24.03 Define and use the necessary vocabulary related to gaming and the different genres.
25.0	Identify popular games and identify commonality between them. The student will be able to:
	25.01 Analyze and deconstruct game environments and interactions.
	25.02 Compare and contrast the top selling video games in terms of player interaction, plot complexity, and reward.
	25.03 Categorize gameplay elements by player type (killer, talker, explorer and achiever).
26.0	Understand the general procedure and requirements of game design. The student will be able to:
	26.01 Describe the design process from conception to production.
	26.02 Explain the iterative nature of game design through the different stages of design iterations including pre-alpha, alpha, beta, release candidate, going gold and support.
	26.03 Develop design plans, for example, character sketches, documentation and storyboards for proposed games.
27.0	Understand the general principles of storytelling for game design. The student will be able to:
	27.01 Identify the essential elements of a story.
	27.02 Describe how creative writing is used as a game design tool.
	27.03 Compare and contrast methods of delivering a story in a game.
28.0	Understand character archetypes and character design. The student will be able to:
	28.01 Research and identify common character archetypes used in computer games.
	28.02 Design character prototypes to physically match archetype.
	28.03 Create character backstory and profile.
29.0	Develop a game design document. The student will be able to:
	29.01 Create a game strategy overview, character overview, and storyboard overview.
	29.02 Define the rules of play and multi-player options.
	29.03 Define strategic positioning of game immersion dynamics and psychological effect.
	29.04 Describe how game layout charts are used in game design.
	29.05 Understand the use of storyboards in the game design industry with regard to environmental illustrations, level designs, character designs, model sheets and GUI designs.
30.0	Understand the process of creating and designing player choice and other game designer strategy considerations. The student will be able to:
	30.01 Describe the use of artificial intelligence challenges in game design and the need for giving the player rest time between challenges.
	30.02 Evaluate the impact of randomness in game design especially as it pertains to pattern recognition.

CTE Standards and Benchmarks	
	30.03 Identify techniques used in the industry to help the player to navigate.
	30.04 Discuss the principles of player-centric design.
	30.05 Examine and discuss design elements that encourage continuous active engagement both mental and physical.
	30.06 Analyze design elements that maintain player interest and vary the degree of challenge.
	30.07 Discuss the need for a balance of design elements for the purpose of rewarding and frustrating players.
31.0	Create and design the game flow as it relates to story and plot. The student will be able to:
	31.01 Identify techniques of introducing the story plot and beginning play.
	31.02 Describe story plot development techniques for the middle of play in game design.
	31.03 Analyze and discuss planning techniques for climax and finale of games.
32.0	Assess common principles and procedures in game flow design. The student will be able to:
	32.01 Assess missions and scenarios game flow techniques.
	32.02 Describe common use of mission design and campaigns.
	32.03 Evaluate usage of static versus dynamic campaigns.
33.0	Describe player challenge rule creation elements. The student will be able to:
	33.01 Research common design methods for clearing obstacles or series of obstacles.
	33.02 Describe common design elements introducing skill, luck and combinations including escalating challenges to games.
	33.03 Identify common design elements used to vary weapons, characters and tools.
	33.04 Discuss the incorporation of risk reward and adaptive challenges (AI).
34.0	Understand the use of inventory systems in game design. The student will be able to:
	34.01 Discuss the various methods of describing items in player’s inventory in contemporary game design.
	34.02 Review and discuss industry methods of communicating how inventory items can have an effect on game play.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Audio/Sound Effects**
Course Number: **8208230**
Course Credit: **1**

Course Description:

This course is focused on students acquiring skills in designing, producing, editing, and integrating audio and sound effects into a game or simulation application.

CTE Standards and Benchmarks	
35.0	Understand the history of audio/sound effects in the entertainment industry. The student will be able to:
35.01	Discuss the role of sound in a visual presentation.
35.02	Describe how audio/sound effects can establish or reinforce the mood.
35.03	Explain the importance of production value.
35.04	Describe the evolution of audio/sound effects production.
35.05	Identify the technology incorporated into the production of sound.
36.0	Perform various job roles typical for an audio technician on a game/simulation project. The student will be able to:
36.01	Identify the job titles of audio technicians and artists typically involved in a game project.
36.02	Work as part of a sound design team.
36.03	Perform the role of the sound designer for a game/simulation project.
36.04	Perform the role of music supervisor for a game/simulation project.
36.05	Perform the role of Foley artist for a game/simulation project.
36.06	Perform the role of voice actor for a game/simulation project.
36.07	Perform the role of recording engineer for a game/simulation project.
36.08	Perform the role of sound editor for a game/simulation project.
36.09	Perform the role of composer/arranger for a game/simulation project.
37.0	Understand intellectual property rights, copyright laws, and plagiarism as they apply to creative assets. The student will be able to:
37.01	Compare and contrast the doctrines of fair use and fair dealing.

CTE Standards and Benchmarks	
	37.02 Describe the transfer and licensing of creative works.
	37.03 Explain the use of “exclusive rights” to intellectual creations.
	37.04 Use digital watermarking to embed copyright information in an audio file.
38.0	Demonstrate a knowledge of production writing as it relates to game and simulation design. The student will be able to:
	38.01 Explain the job of a scriptwriter and outline the elements of a script.
	38.02 Breakdown a script into audio production elements.
	38.03 Write simple dialog.
	38.04 Translate script elements into lyrics for a theme song.
	38.05 Write narration or instructions for game/simulation.
39.0	Demonstrate appropriate voice acting skills. The student will be able to:
	39.01 Read aloud in a professional manner.
	39.02 Receive and properly act upon direction given by the producer/director.
	39.03 Understand the concept of voice acting and playing a role while speaking.
	39.04 Perform various voice acting assignments in a professional manner according to industry standards.
40.0	Demonstrate basic audio production. The student will be able to:
	40.01 Describe digital audio storage concepts and digital storage media.
	40.02 Operate digital recording decks and other digital storage devices.
	40.03 Describe the function and operation of digital audio workstations.
	40.04 Edit, cut, erase, and insert sound utilizing various digital production techniques.
	40.05 Perform digital noise reduction and noise extraction via spectral display.
41.0	Set-up and configure a computer for audio applications. The student will be able to:
	41.01 Install basic peripheral devices related to audio programs.
	41.02 Install and configure software related to audio programs.
	41.03 Demonstrate basic knowledge of computer system requirements.
	41.04 Install plug-ins or additional audio source material such as beats and or samples.
	41.05 Diagram the signal flow of a digital audio workstation.

CTE Standards and Benchmarks	
42.0	Operate an audio workstation. The student will be able to:
42.01	Demonstrate knowledge of the digital audio workstation interface.
42.02	Create and arrange a multi-track project.
42.03	Create interest and effect using editing techniques.
42.04	Design and edit audio using a waveform editor.
42.05	Record audio directly to the digital audio workstation.
42.06	Mix audio.
42.07	Demonstrate skill in using audio effects and plug-ins.
42.08	Prepare an audio project for finishing and final mix down.
42.09	Transfer audio files between various audio software applications.
42.10	Demonstrate the understanding of audio file bit depth, bandwidth and dithering and be able to explain when and where these apply in various applications of digital audio production.
42.11	Export finished audio.
43.0	Demonstrate application of MIDI in a game/simulation project. The student will be able to:
43.01	Demonstrate an understanding of MIDI.
43.02	Discuss the advantage and use of MIDI in a game/simulation.
43.03	Discuss the limitations of MIDI.
43.04	Utilize a computer and multiple MIDI instruments.
43.05	Record a single sound track; add multiple sound tracks, and change MIDI voices using the software.
43.06	Export a MIDI soundtrack for use in a game/simulation.
43.07	Export a MIDI sound effect for use in a game/simulation.
43.08	Apply MIDI file to an object or game/simulation element.
44.0	Incorporate audio assets into game/simulation engine. The student will be able to:
44.01	Describe the audio effects workflow.
44.02	Explain audio codecs and formats used in game/simulation engines.
44.03	Import audio into the game/simulation engine.
44.04	Use appropriate naming conventions for audio assets.

CTE Standards and Benchmarks	
	44.05 Describe the use of 3D and surround sound.
	44.06 Apply knowledge of distance/spatial effects including surround sound in a game/simulation.
	44.07 Contrast the audio environment as it relates to the visual environment.
45.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	45.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	45.02 Explain emergency procedures to follow in response to workplace accidents.
	45.03 Create a disaster and/or emergency response plan.
46.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	46.01 Employ leadership skills to accomplish organizational goals and objectives.
	46.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	46.03 Conduct and participate in meetings to accomplish work tasks.
	46.04 Employ mentoring skills to inspire and teach others.
47.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	47.01 Identify and demonstrate positive work behaviors needed to be employable.
	47.02 Develop personal career plan that includes goals, objectives, and strategies.
	47.03 Examine licensing, certification, and industry credentialing requirements.
	47.04 Maintain a career portfolio to document knowledge, skills, and experience.
	47.05 Evaluate and compare employment opportunities that match career goals.
	47.06 Identify and exhibit traits for retaining employment.
	47.07 Identify opportunities and research requirements for career advancement.
	47.08 Research the benefits of ongoing professional development.
	47.09 Examine and describe entrepreneurship opportunities as a career planning option.
48.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
	48.01 Identify and describe the services and legal responsibilities of financial institutions.
	48.02 Describe the effect of money management on personal and career goals.
	48.03 Develop a personal budget and financial goals.

CTE Standards and Benchmarks
48.04 Complete financial instruments for making deposits and withdrawals.
48.05 Maintain financial records.
48.06 Read and reconcile financial statements.
48.07 Research, compare and contrast investment opportunities.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Video/Special Effects**
Course Number: **8208240**
Course Credit: **1**

Course Description:

This course is focused on students acquiring skills in designing, producing, editing, and integrating video and special effects into a game or simulation application.

CTE Standards and Benchmarks	
49.0	Understand the history of video effects in the entertainment. The student will be able to:
49.01	Understand the role of video in a visual presentation.
49.02	Understand how video effects can establish or reinforce the mood.
49.03	Understand the importance of production value.
49.04	Understand the history of video effects production.
49.05	Understand the technology incorporated into the production video and video effects.
50.0	Understand the various job titles and responsibilities video technician as it relates to game and simulation design. The student will be able to:
50.01	Identify the job titles of video technicians and artist game project.
50.02	Demonstrate the ability to work as part of a video production team.
50.03	Perform the role of the video technical director for a game/simulation project.
50.04	Perform the role of video editor for a game/simulation project.
50.05	Perform the role of camera operator for a game/simulation project.
50.06	Perform the role of special effects coordinator for a game/simulation project.
50.07	Perform the role of video recording operator for a game/simulation project.
50.08	Perform the role of video effects artist for a game/simulation project.
50.09	Perform the role of compositor for a game/simulation project.
51.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
51.01	Understand the use of “Fair use and Fair Dealing”.

CTE Standards and Benchmarks	
	51.02 Understand the transfer and licensing of creative works.
	51.03 Understand the use of “exclusive rights” to intellectual creations.
	51.04 Demonstrate the use of digital watermarking.
52.0	Demonstrate a knowledge of production writing as it relates to game and simulation design. The student will be able to:
	52.01 Explain the job of a scriptwriter and outline the elements of a script.
	52.02 Demonstrate ability to breakdown a script into video production elements.
	52.03 Demonstrate ability to write simple dialog.
	52.04 Demonstrate ability to translate script elements into production schedule.
	52.05 Demonstrate ability to write narration or instructions for game/simulation.
53.0	Demonstrate appropriate acting skills. The student will be able to:
	53.01 Demonstrate the ability to read aloud in a professional manner.
	53.02 Demonstrate the ability to receive and properly act upon direction given by the producer/director.
	53.03 Understand the concept of acting and playing a role while speaking.
	53.04 Perform the various assignments in a professional manner according to industry standards.
54.0	Demonstrate basic video production. The student will be able to:
	54.01 Use current industry standard production video equipment.
	54.02 Operate camera in studio and location (field) production environments.
	54.03 Demonstrate understanding of digital video storage concepts and digital storage media.
	54.04 Demonstrate knowledge of and the ability to operate digital recording decks, and other digital storage devices.
	54.05 Identify and select microphones for production needs.
	54.06 Determine appropriate lighting needs for production settings.
	54.07 Identify location and studio lighting types, method of use and application.
55.0	Demonstrate set-up and configuration of a computer for video applications. The student will be able to:
	55.01 Install basic peripheral devices related to video programs.
	55.02 Install and configure software related to video programs.
	55.03 Demonstrate basic knowledge of computer system requirements.

CTE Standards and Benchmarks	
	55.04 Demonstrate basic knowledge of installing plug-ins or additional audio source material such as beats and or samples.
	55.05 Understand the signal flow of a digital video workstation.
56.0	Demonstrate the basic operation of a video workstation. The student will be able to:
	56.01 Demonstrate knowledge of the digital video workstation interface.
	56.02 Demonstrate a working familiarity and understanding of the function and operation of digital video workstations.
	56.03 Demonstrate ability to edit, cut, erase, and insert video utilizing various digital production techniques.
	56.04 Record video directly to the digital video workstation.
	56.05 Demonstrate knowledge of editing video according to message.
	56.06 Demonstrate skill in using video effects and plug-ins.
	56.07 Prepare a video project for final compositing and export.
	56.08 Transfer video files between various video software applications.
	56.09 Export finished video.
57.0	Incorporate video assets into game/simulation engine. The student will be able to:
	57.01 Demonstrate knowledge of the video effects workflow.
	57.02 Demonstrate knowledge of video codecs and formats used in game/simulation engines.
	57.03 Demonstrate knowledge and ability to import video into the game/simulation engine.
	57.04 Use appropriate naming conventions for video assets.
	57.05 Understand the use of placing video assets into a 3D environment.
	57.06 Demonstrate knowledge of distance/spatial video effects in relation to sound effects in a game/simulation.
	57.07 Understand the audio environment as it relates to the visual environment.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Game/Simulation/Animation Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8208300
CIP Number	0550041120
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Game/Simulation Designer, Game Programmer, and Game Software Developer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, and implementation issues. Specialized programming skills involving advanced mathematical calculations and physics are also integrated into the curriculum.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1 Options	8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
	8208110	Game & Simulation Foundations	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @7 7G DIGI MEDIA 7G COMP PROG 7G	1 credit	15-1199	2	CT
Course 2	8208120	Game & Simulation Design		1 credit		2	CT
Course 3	8208330	Game & Simulation Programming		1 credit	15-1131	3	CT
Course 4	8208340	Multi-User Game & Simulation Programming		1 credit	15-1131	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Program Recommendations

This program is project-based and focuses on broad, transferable skills and stresses understanding and demonstration of the following rudiments of the game and simulation industry: production planning, elements of production design, storyboarding, elements of visual design, integration of digital audio and digital video into new game/simulation productions, programming for single and multi-user environments, delivery systems, and collaboration/teamwork.

The Foundations and Design courses should be taken in sequence prior to the Programming and Multi-User Programming courses. The Programming and Multi-User Programming courses may be taken concurrently. It is highly recommended that students complete a programming course prior to taking the last two courses of this program. Digital Information Technology may be taken concurrently with either the Foundations course or the Design course.

The Programming (8208330) and Multi-User Programming (8208340) courses should be offered with a concentration on one programming language to ensure students are prepared for industry certifications.

The Game/Simulation/Animation Advanced Applications program (8208400) is an appropriate follow-on capstone program.

The Game/Simulation/Animation Programming program lends itself to integration of the core academic subjects of language arts, math, science, visual arts, and social studies into project activities. It is through a balanced and integrated curriculum that students attain the attitudes, skills, and

knowledge needed to compete successfully in today's work force. To achieve total curriculum integration, academic and career and technical education teachers should be scheduled with common planning times.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Identify commonly used art and animation production tools in the game design industry.
11.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
12.0 Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development.
13.0 Identify tools and software commonly used in game development.
14.0 Investigate career opportunities in the game industry.
15.0 Demonstrate research and information fluency.
16.0 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
17.0 Explore the methods used to create and sustain player immersion.
18.0 Describe the game development life cycle.
19.0 Demonstrate the professional level of written and oral communication required in the game development industry.
20.0 Understand the core tasks and challenges that face a video game design team.
21.0 Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives.
22.0 Create a working game or simulation as part of a team.
23.0 Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game.
24.0 Categorize the different gaming genres.
25.0 Identify popular games and identify commonality between them.
26.0 Understand the general procedure and requirements of game design.
27.0 Understand the general principles of storytelling for game design.
28.0 Understand character archetypes and character design.
29.0 Develop a game design document.
30.0 Understand the process of creating and designing player choice and other game designer strategy considerations.
31.0 Create and design the game flow as it relates to story and plot.
32.0 Assess common principles and procedures in game flow design.

33.0 Describe player challenge rule creation elements.
34.0 Understand the use of inventory systems in game design.
35.0 Identify functions of information processing.
36.0 Test programs.
37.0 Plan program design.
38.0 Code programs.
39.0 Perform program maintenance.
40.0 Create and maintain documentation.
41.0 Evaluate assigned game programming tasks.
42.0 Implement enhanced program structures.
43.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
44.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
45.0 Demonstrate personal money-management concepts, procedures, and strategies.
46.0 Identify and describe basic network terminology and network security.
47.0 Game configuration.
48.0 Test programs.
49.0 Plan program design.
50.0 Create and maintain documentation.
51.0 Code programs.
52.0 Demonstrate an understanding of operating systems, environments, and platforms.
53.0 Implement enhanced program structures.
54.0 Implement multimedia programming.
55.0 Develop an understanding of programming techniques and concepts.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: Game & Simulation Foundations
Course Number: 8208110
Course Credit: 1

Course Description:

This course is designed to provide an introduction to game and simulation concepts and careers, the impact game and simulation has on society and industry, and basic game/simulation design concepts such as rule design, play mechanics, and media integration. This course compares and contrasts games and simulations, key development methodologies and tools, careers, and industry-related information. This course also covers strategies, processes, and methods for conceptualizing a game or simulation application; storyboarding techniques; and development tools.

Hands-on activities using an entry-level game development tool should be integrated into the curriculum.

Game & Simulation Creation
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

CTE Standards and Benchmarks	
16.0	Identify commonly used art and animation production tools in the game design industry. The student will be able to:
16.01	Identify, categorize and discuss art and animation tools commonly used in game design.
17.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
17.01	Understand the use of “Fair Use and Fair Dealing”.
17.02	Understand the transfer and licensing of creative works.
17.03	Understand the use of “exclusive rights” to intellectual creations.
17.04	Demonstrate the use of digital watermarking.
18.0	Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development. The student will be able to:
18.01	Identify and demonstrate positive work behaviors needed to be employable.
18.02	Maintain a career portfolio to document knowledge, skills, and experience.
18.03	Evaluate and compare employment opportunities that match career goals.
18.04	Identify and exhibit traits for retaining employment.

CTE Standards and Benchmarks	
19.0	Identify tools and software commonly used in game development. The student will be able to:
19.01	Identify and discuss the popular game development tools currently used in the industry.
19.02	Identify and discuss popular gaming engines.
19.03	Identify and discuss popular world building tools.
20.0	Investigate career opportunities in the game industry. The student will be able to:
20.01	Describe job requirements for a variety of occupations within the game development industry.
20.02	Identify current employment trends and career opportunities in the game industry.
21.0	Demonstrate research and information fluency. The student will be able to:
21.01	Play games to research and collect game play data.
21.02	Evaluate, analyze and document game styles and playability.
21.03	Determine the dramatic elements in games, including kinds of fun, player types and nonlinear storytelling.
22.0	Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design. The student will be able to:
22.01	Test and analyze games to determine the quality of rules, interfaces, navigation, performance, play, artistry and longevity in design and structure.
22.02	Research and evaluate the game analysis techniques used by the video game industry.
22.03	Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
22.04	Evaluate professional reviews and write a critical analysis of a current video game.
23.0	Explore the methods used to create and sustain player immersion. The student will be able to:
23.01	Research and define the term “player immersion”.
23.02	Explore and explain the factors that create player immersion in a game.
23.03	Examine popular games and explain the methods each game uses to increase player immersion.
24.0	Describe the game development life cycle. The student will be able to:
24.01	Identify steps in the pre-production process including the proof of concept and market research.
24.02	Describe the iterative prototyping process – Alpha, Beta, RTM.
24.03	Determine platform, technology and scripting requirements.
24.04	Implement techniques of scenario development, levels, and missions.
24.05	Discuss game testing requirements and methods.

CTE Standards and Benchmarks	
	24.06 Identify and describe maintenance, upgrade and sequel issues.
25.0	Demonstrate the professional level of written and oral communication required in the game development industry. The student will be able to:
	25.01 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
	25.02 Organize ideas and communicate oral and written messages appropriate for the game development industry environment.
26.0	Understand the core tasks and challenges that face a video game design team. The student will be able to:
	26.01 Identify and define the roles and responsibilities of team members on a video game design team.
	26.02 Explore and discuss methods of communications and scheduling for design teams.
27.0	Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives. The student will be able to:
	27.01 Employ leadership skills to accomplish organizational goals and objectives.
	27.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	27.03 Conduct and participate in meetings to accomplish work tasks.
	27.04 Employ mentoring skills to inspire and teach others.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Design**
Course Number: **8208120**
Course Credit: **1**

Course Description:

This course covers fundamental principles of designing a game or a simulation application, rules and strategies of play, conditional branching, design and development constraints, use of sound and animation, design tools, and implementation issues. The content includes market research, product design documentation, storyboarding, proposal development, and presentation of a project report. Emphasis is placed on the techniques needed to develop well-documented, structured game or simulation programs. Extensive use is made of evaluating and analyzing existing games or simulations.

Hands-on activities using an entry-level game development tool should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the creation and presentation of a playable game with design documentation.**

Game/Simulation Project
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

CTE Standards and Benchmarks	
28.0	Create a working game or simulation as part of a team. The student will be able to:
28.01	Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
28.02	Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
28.03	Using a simple game development tool, create a game or simulation.
28.04	Present the game or simulation.
29.0	Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game. The student will be able to:
29.01	Use industry standard game design production documents to create a game design production plan.
30.0	Categorize the different gaming genres. The student will be able to:
30.01	Research, compare and categorize the different gaming genres.
30.02	Analyze examples of different gaming genres.

CTE Standards and Benchmarks	
	30.03 Define and use the necessary vocabulary related to gaming and the different genres.
31.0	Identify popular games and identify commonality between them. The student will be able to:
	31.01 Analyze and deconstruct game environments and interactions.
	31.02 Compare and contrast the top selling video games in terms of player interaction, plot complexity, and reward.
	31.03 Categorize gameplay elements by player type (killer, talker, explorer and achiever).
32.0	Understand the general procedure and requirements of game design. The student will be able to:
	32.01 Describe the design process from conception to production.
	32.02 Explain the iterative nature of game design through the different stages of design iterations including pre-alpha, alpha, beta, release candidate, going gold and support.
	32.03 Develop design plans, for example, character sketches, documentation and storyboards for proposed games.
33.0	Understand the general principles of storytelling for game design. The student will be able to:
	33.01 Identify the essential elements of a story.
	33.02 Describe how creative writing is used as a game design tool.
	33.03 Compare and contrast methods of delivering a story in a game.
34.0	Understand character archetypes and character design. The student will be able to:
	34.01 Research and identify common character archetypes used in computer games.
	34.02 Design character prototypes to physically match archetype.
	34.03 Create character backstory and profile.
35.0	Develop a game design document. The student will be able to:
	35.01 Create a game strategy overview, character overview, and storyboard overview.
	35.02 Define the rules of play and multi-player options.
	35.03 Define strategic positioning of game immersion dynamics and psychological effect.
	35.04 Describe how game layout charts are used in game design.
	35.05 Understand the use of storyboards in the game design industry with regard to environmental illustrations, level designs, character designs, model sheets and GUI designs.
36.0	Understand the process of creating and designing player choice and other game designer strategy considerations. The student will be able to:
	36.01 Describe the use of artificial intelligence challenges in game design and the need for giving the player rest time between challenges.
	36.02 Evaluate the impact of randomness in game design especially as it pertains to pattern recognition.

CTE Standards and Benchmarks	
	36.03 Identify techniques used in the industry to help the player to navigate.
	36.04 Discuss the principles of player-centric design.
	36.05 Examine and discuss design elements that encourage continuous active engagement both mental and physical.
	36.06 Analyze design elements that maintain player interest and vary the degree of challenge.
	36.07 Discuss the need for a balance of design elements for the purpose of rewarding and frustrating players.
37.0	Create and design the game flow as it relates to story and plot. The student will be able to:
	37.01 Identify techniques of introducing the story plot and beginning play.
	37.02 Describe story plot development techniques for the middle of play in game design.
	37.03 Analyze and discuss planning techniques for climax and finale of games.
38.0	Assess common principles and procedures in game flow design. The student will be able to:
	38.01 Assess missions and scenarios game flow techniques.
	38.02 Describe common use of mission design and campaigns.
	38.03 Evaluate usage of static versus dynamic campaigns.
39.0	Describe player challenge rule creation elements. The student will be able to:
	39.01 Research common design methods for clearing obstacles or series of obstacles.
	39.02 Describe common design elements introducing skill, luck and combinations including escalating challenges to games.
	39.03 Identify common design elements used to vary weapons, characters and tools.
	39.04 Discuss the incorporation of risk reward and adaptive challenges (AI).
40.0	Understand the use of inventory systems in game design. The student will be able to:
	40.01 Discuss the various methods of describing items in player’s inventory in contemporary game design.
	40.02 Review and discuss industry methods of communicating how inventory items can have an effect on game play.

Florida Department of Education
Student Performance Standards

Course Title: **Game & Simulation Programming**
Course Number: **8208330**
Course Credit: **1**

Course Description:

This course is focused on students acquiring the appropriate programming skills for rendering a game or simulation product, including program control, conditional branching, memory management, score-keeping, timed event strategies and methodologies, and implementation issues.

Standards included in this course of instruction have been aligned to the academic courses shown below. This table shows the number of aligned benchmarks, the total number of academic benchmarks, and the percentage of alignment.

CTE Standards and Benchmarks	
41.0	Identify functions of information processing. The student will be able to:
41.01	Identify characteristics of high-level languages.
41.02	Identify characteristics of operating systems.
41.03	Identify characteristics of a network.
41.04	Identify needs for software development in the game/simulation industry.
41.05	Identify causes of software development problems in the game/simulation industry.
41.06	Identify most appropriate languages for solving game/simulation industry problems.
41.07	Manipulate data between numbering systems.
41.08	Identify how numeric and non-numeric data are represented in memory.
41.09	Distinguish among integer, fixed-point, and floating-point calculations.
42.0	Test programs. The student will be able to:
42.01	Develop a plan for testing programs.
42.02	Develop test harnesses for use in program testing.
42.03	Perform debugging activities.
42.04	Distinguish among the different types of program and design errors.
42.05	Evaluate program test results.

CTE Standards and Benchmarks	
	42.06 Execute programs and subroutines as they relate to the total application.
	42.07 Use trace routines of compilers to assist in program debugging.
	42.08 Compile and run programs.
	42.09 Create a stable code base.
43.0	Plan program design. The student will be able to:
	43.01 Formulate a plan to determine program specifications individually or in groups.
	43.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
	43.03 Design programs to solve problems using problem-solving strategies.
	43.04 Prepare proper input/output layout specifications.
	43.05 Examine existing utility programs and subroutines for use with other programs.
	43.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
44.0	Code programs. The student will be able to:
	44.01 Utilize reference manuals.
	44.02 Write programs according to recognized programming standards.
	44.03 Write internal documentation statements as needed in the program source code.
	44.04 Code programs in high-level languages for game/simulation applications.
	44.05 Write code that accesses sequential, random, and direct files.
	44.06 Code programs using logical statements (e.g., If-Then-Else, Do...While).
	44.07 Enter and modify source code using a program language editor.
	44.08 Code routines within programs that validate input data.
	44.09 Use the rounding function in calculations within programs.
	44.10 Write programs as part of a development team.
	44.11 Write event-driven programs.
	44.12 Write programs using timed-event strategies and methodologies.
	44.13 Write programs that include score keeping.
45.0	Perform program maintenance. The student will be able to:

CTE Standards and Benchmarks	
	45.01 Review requested modification of programs and establish a plan of action.
	45.02 Design needed modifications in conformance with established standards.
	45.03 Code, test, and debug modifications prior to updating production code.
	45.04 Update production programs and documentation with changes.
	45.05 Analyze output to identify and annotate errors or enhancements.
46.0	Create and maintain documentation. The student will be able to:
	46.01 Write documentation to assist operators and end-users.
	46.02 Follow established documentation standards.
	46.03 Update existing documentation to reflect program changes.
47.0	Evaluate assigned game programming tasks. The student will be able to:
	47.01 Estimate the time necessary to write a program.
48.0	Implement enhanced program structures. The student will be able to:
	48.01 Write programs that include tables or arrays and routines for data entry and lookup.
	48.02 Write programs to import/export data from external sources.
	48.03 Write programs that use iteration.
	48.04 Write routines that incorporate “help” text.
	48.05 Write programs that read and write random files.
	48.06 Write interactive programs.
	48.07 Design screen layouts for use in interactive programs.
	48.08 Write programs using object-oriented languages.
	48.09 Write programs that include data structures (e.g., stacks, queues, trees, linked lists).
	48.10 Write programs that are event-driven to support player goals and actions.
49.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	49.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	49.02 Explain emergency procedures to follow in response to workplace accidents.
	49.03 Create a disaster and/or emergency response plan.

CTE Standards and Benchmarks	
50.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
50.01	Employ leadership skills to accomplish organizational goals and objectives.
50.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
50.03	Examine licensing, certification, and industry credentialing requirements.
50.04	Maintain a career portfolio to document knowledge, skills, and experience.
50.05	Evaluate and compare employment opportunities that match career goals.
50.06	Identify and exhibit traits for retaining employment.
50.07	Identify opportunities and research requirements for career advancement.
50.08	Research the benefits of ongoing professional development.
50.09	Examine and describe entrepreneurship opportunities as a career planning option.
51.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
51.01	Identify and describe the services and legal responsibilities of financial institutions.
51.02	Describe the effect of money management on personal and career goals.
51.03	Develop a personal budget and financial goals.
51.04	Complete financial instruments for making deposits and withdrawals.
51.05	Maintain financial records.
51.06	Read and reconcile financial statements.
51.07	Research, compare and contrast investment opportunities.

Florida Department of Education
Student Performance Standards

Course Title: **Multi-User Game & Simulation Programming**
Course Number: **8208340**
Course Credit: **1**

Course Description:

This course is focused on students acquiring the appropriate programming skills for rendering a game or simulation product, including program control, conditional branching, score-keeping, timed event strategies and methodologies, and implementation issues specific to multi-user game/simulation products.

CTE Standards and Benchmarks	
52.0	Identify and describe basic network terminology and network security. The student will be able to:
52.01	Define networking and describe the purpose of a network.
52.02	Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards).
52.03	Describe the various types of network topologies.
52.04	Describe the various types of game protocols
52.05	Demonstrate knowledge of general security concepts.
52.06	Develop an awareness of communication security concepts.
52.07	Develop an awareness of network infrastructure security.
52.08	Describe the various types of multiplayer game architectures.
52.09	Identify networking and server design requirements for multi-player games.
52.10	List and describe performance metrics for networked games.
53.0	Game configuration. The student will be able to:
53.01	Create a window to run a game.
53.02	Describe and use appropriate game libraries to run a windowed game.
53.03	Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available.
53.04	Troubleshoot problems with computer hardware based on different graphic modes of the game.
53.05	Describe ethical issues and problems associated with computer games.

CTE Standards and Benchmarks	
	53.06 Read and comprehend technical and non-technical reading assignments related to course content including trade journals, books, magazines and electronic sources.
	53.07 Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.
	53.08 Explore, design, implement, and evaluate organizational structures and cultures for managing project teams.
	53.09 Identify characteristics of operating systems and graphics pipeline.
	53.10 Distinguish among integer and floating-point bounding box collision calculations.
	53.11 Illustrate various configurations of software libraries.
54.0	Test programs. The student will be able to:
	54.01 Develop data for use in program testing.
	54.02 Perform debugging activities.
	54.03 Distinguish among the different types of program and design errors.
	54.04 Evaluate program test results.
	54.05 Execute programs and subroutines as they relate to the total application.
	54.06 Use trace routines of compilers to assist in program debugging.
	54.07 Compile and run programs.
55.0	Plan program design. The student will be able to:
	55.01 Formulate a plan to determine program specifications individually or in groups.
	55.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
	55.03 Design programs to solve problems using problem-solving strategies.
	55.04 Prepare proper input/output layout specifications.
	55.05 Examine existing utility programs and subroutines for use with other programs.
	55.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
56.0	Create and maintain documentation. The student will be able to:
	56.01 Write documentation to assist operators and end-users.
	56.02 Follow established documentation standards.
	56.03 Update existing documentation to reflect program changes.
57.0	Code programs. The student will be able to:

CTE Standards and Benchmarks	
	57.01 Utilize reference manuals.
	57.02 Write programs according to recognized programming standards.
	57.03 Write internal documentation statements as needed in the program source code.
	57.04 Code programs in high-level languages for gaming and simulation applications.
	57.05 Write code that accesses sequential, indexed sequential, random, and direct files.
	57.06 Code programs using logical statements (e.g., if-then-else, do...while).
	57.07 Enter and modify source code using a program language editor.
	57.08 Code routines within programs that validate input data.
	57.09 Use the rounding function in calculations within programs.
	57.10 Write programs that display text.
	57.11 Demonstrate proficiency in drawing lines using graphic primitive functions.
	57.12 Demonstrate proficiency in drawing rectangles using graphic primitive functions.
	57.13 Demonstrate proficiency in drawing circles using graphic primitive functions.
	57.14 Demonstrate proficiency in drawing ellipses using graphic primitive functions.
	57.15 Demonstrate proficiency in drawing polygons using graphic primitive functions.
	57.16 Write programs that use composite graphic objects.
	57.17 Write programs that load a bitmap for background.
	57.18 Write programs that use a sprite handler.
	57.19 Write programs that use animation.
	57.20 Write programs that use scrolling.
	57.21 Write programs that use transparency.
58.0	Demonstrate an understanding of operating systems, environments, and platforms. The student will be able to:
	58.01 Identify various types of operating systems/environments for different computer hardware platforms.
	58.02 Assess and analyze the functions of different operating systems.
	58.03 Distinguish between different types of computer hardware platforms.
59.0	Implement enhanced program structures. The student will be able to:

CTE Standards and Benchmarks	
	59.01 Write programs that include tables or arrays and routines for data entry and lookup.
	59.02 Write routines to sort arrays.
	59.03 Write programs that sort records in files.
	59.04 Write programs to process transactions.
	59.05 Write programs that use iteration.
	59.06 Write programs that read and write sequential files.
	59.07 Write programs that read and write random files.
60.0	Implement multimedia programming. The student will be able to:
	60.01 Demonstrate proficiency in creating multiple composite objects.
	60.02 Demonstrate proficiency in moving composite graphics objects.
	60.03 Demonstrate proficiency in rotating composite graphics objects by hand.
	60.04 Distinguish between flock and flee artificial intelligence algorithms.
	60.05 Write programs that use blitting.
	60.06 Simulate circular game board.
	60.07 Demonstrate proficiency in creating a firing simulation.
	60.08 Identify the basic constructs used in bounding box collision algorithm.
	60.09 Identify the basic constructs used in truer bounding box collision.
	60.10 Demonstrate proficiency in creating a creating a bouncing simulation.
	60.11 Simulate pattern-based movement.
	60.12 Simulate multiple sprites movement.
	60.13 Identify the basic constructs used in keyboard input.
	60.14 Identify the basic constructs used in mouse input.
	60.15 Identify the basic constructs used in double buffering.
61.0	Develop an understanding of programming techniques and concepts. The student will be able to:
	61.01 Identify the basic constructs used in structured programming.
	61.02 Distinguish between top-down and bottom-up design.

CTE Standards and Benchmarks
61.03 Distinguish between iteration and recursion.
61.04 Evaluate Boolean expressions.
61.05 Distinguish between interpreters and compilers.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)
English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Game/Simulation/Animation Advanced Applications**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8208400
CIP Number	0550041117
Grade Level	9-12
Program Length	1 credit
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program is designed to prepare students for employment as a Game/Simulation Project Manager.

The content includes but is not limited to a capstone opportunity for students to learn and apply principles of project management, team-building, scheduling, coordination and budgeting to create a complete game or simulation product.

The Game/Simulation/Animation Advanced Applications program (8208400) is an appropriate follow-on capstone program for the following programs:

- Game/Simulation/Animation Visual Design (8208100)
- Game/Simulation/Animation Audio/Video Effects (8208200)
- Game/Simulation/Animation Programming (8208300)

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of a single capstone course.

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8208400	Game, Simulation, & Animation Advanced Applications	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @ 7 7G	1 credit	15-1199	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

The Game, Simulation, & Animation Advanced Applications program **must** include the following components:

Pre-Project Planning Conference: The teacher and all team members must participate in a pre-project planning conference, which is essential to designing advanced learning experiences that are appropriate for each individual's learning needs and career interests. It is critical that all parties involved understand and agree on time schedules, expectations, advanced learning applications and evaluation criteria.

Project Criteria: The following criteria shall be met when choosing the Game, Simulation, & Animation Advanced Applications project:

The project must allow experiences that utilize both skills and knowledge directly related to the student's career interests and the Game, Simulation, & Animation Education program in which the student is enrolled or has completed.

The project must provide opportunities for members to experience a high level of interactivity related to the challenges of learning and applying advanced skills.

The project must provide a safe and ethically sound environment with up-to-date facilities and equipment.

Each student must maintain a journal with daily entries describing:

- Time spent on the project (log in and log out)
- Description of the activity for the period(s)
- Materials/equipment/fixtures used
- Problems identified
- Possible solutions to problems identified
- Work accomplished
- Solutions attempted
- Solutions that failed
- Which led to a new problem statement

- Video or Still Images of the project as it progresses.
- Plans, sketches, drawings, patterns, fixtures or other documentation of components designed or created

Each student will be expected to maintain a portfolio of the project according to the standards contained in this curriculum framework.

A progress report at mid-term will be given by each student to include a written research paper, that describes the area of investigation and an oral presentation to the remainder of the class and instructor or supervising faculty team, on the progress of the project, and all work accomplished. The progress report will be the basis for the mid-term evaluation grade.

A final oral progress report presentation at the end of the course will be given by each student or team that includes:

- a review of the portfolio and the journal,
- a demonstration of the project's final product
- results
- problems identified and solutions that worked or did not work, and
- a conclusion.

The final progress report will be the basis for the final exam evaluation grade.

When offered for multiple credits, the student should have varied learning experiences in order to provide maximum education exposure.

The course may be supervised by a faculty team consisting of the members of the faculty who will be granting the multiple credit(s) if that is the case.

Project Experience: This component shall provide a match between the student's career interests and a project-based situation that will provide exposure to the broad aspects of the selected industry. The assigned tasks should allow a progression and rotation through experiences requiring a variety of knowledge, skills and abilities at increasingly higher levels related to the student's studies and career interests.

Supervision: Teacher-coordinators of the Game, Simulation, & Animation Advanced Applications project must monitor and support learning. Students must also be evaluated a minimum of once per grading period by the teacher-coordinator. The evaluation should assess how well the student is progressing toward goals established by the teacher-coordinator. Portfolio assessment, orchestrated by the teacher-coordinator, is a recommended method of student assessment.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Complete a skills inventory.
02.0 Demonstrate acceptable work values.
03.0 Demonstrate the ability to identify and solve problems.
04.0 Successfully work as a member of a team.
05.0 Manage time according to a plan.
06.0 Keep acceptable records of progress, problems and solutions.
07.0 Plan, organize and carry out a project plan.
08.0 Manage resources.
09.0 Use tools, materials, and processes in an appropriate and safe manner.
10.0 Demonstrate an understanding of the game and simulation development process.
11.0 Demonstrate appropriate scientific content related to the project.
12.0 Demonstrate appropriate mathematics content related to the project.
13.0 Research content related to the project and document the results.
14.0 Use presentation skills, and appropriate media to describe the progress, results and outcome of the experience.
15.0 Demonstrate competency in the area of expertise related to the Game, Simulation & Animation education program previously completed that this project is based upon.

Florida Department of Education
Student Performance Standards

Course Title: **Game, Simulation, & Animation Advanced Applications**
Course Number: **8208400**
Course Credit: **1**

Course Description:

This is a project-based capstone course to provide Game, Simulation & Animation students with the opportunity to develop a project from vision to reality. Students work in teams to research, plan, design, create, test, redesign, test again, and then produce a finished game or simulation product.

CTE Standards and Benchmarks	
01.0	Complete a safety skills inventory. The student will be able to:
01.01	Practice safety procedures while enrolled in this course.
01.02	Demonstrate an understanding of safety and general policies and procedures.
02.0	Demonstrate acceptable project values. The student will be able to:
02.01	Maintain a positive relationship with peers.
02.02	Demonstrate adaptive self-management skills.
02.03	Rotate through a wide variety of increasingly responsible experiences.
02.04	Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.
03.0	Demonstrate the ability to identify and solve problems. The student will be able to:
03.01	Prepare a design brief for each step in the project plan to identify constraints or design boundaries.
03.02	Identify possible solutions for each design brief.
03.03	Complete research and development activities associated with each design brief.
03.04	Document problems as they arise.
03.05	Prepare a problem statement for any activity that is not successful.
03.06	Identify possible solutions for the new problem statement.
03.07	Continue the R & D process until workable solutions are found to each problem stated.
04.0	Successfully work as a member of a team. The student will be able to:
04.01	Accept responsibility for specific tasks in a given situation.

CTE Standards and Benchmarks	
	04.02 Document progress, and provide feedback on work accomplished in a timely manner.
	04.03 Complete assigned tasks in a timely and professional manner.
	04.04 Reassign responsibilities when the need arises.
	04.05 Complete daily tasks as assigned on one's own initiative.
05.0	Manage time according to a plan. The student will be able to:
	05.01 Set realistic time frames and schedules.
	05.02 Keep a written time sheet of work accomplished on a daily basis.
	05.03 Meet goals and objectives set by the team.
	05.04 Identify individual priorities.
	05.05 Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.
06.0	Keep acceptable records of progress problems and solutions. The student will be able to:
	06.01 Develop a record keeping system in the form of a log book to record daily progress.
	06.02 Use a project journal to identify problem statement.
	06.03 Develop a portfolio of work accomplished to include design drawings, research, drawings and plans, storyboards, models, mock-ups and prototypes.
07.0	Plan, organize, and carry out a project plan. The student will be able to:
	07.01 Determine the scope of a project.
	07.02 Organize the team according to individual strengths.
	07.03 Assign specific tasks within a team.
	07.04 Determine project priorities.
	07.05 Identify required resources.
	07.06 Plan research, design, development, and evaluation activities as required.
	07.07 Carry out the project plan to successful completion.
08.0	Manage resources. The student will be able to:
	08.01 Identify required resources for each stage of the project plan.
	08.02 Determine the methods needed to acquire needed resources.
	08.03 Demonstrate good judgment in the use of resources.

CTE Standards and Benchmarks	
	08.04 Recycle and reuse resources where appropriate.
	08.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
09.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	09.01 Identify the proper tool for a given job.
	09.02 Use tools and machines in a safe manner.
	09.03 Adhere to laboratory or job site safety rules and procedures.
	09.04 Identify the application of processes appropriate to the task at hand.
	09.05 Identify materials appropriate to their application.
10.0	Demonstrate an understanding of the game and simulation development process. The student will be able to:
	10.01 State the goals of the game or simulation clearly.
	10.02 Identify and write a plan to achieve each goal.
	10.03 Develop a list of materials and content required for each goal.
	10.04 Develop a step by step procedure for developing the game or simulation.
	10.05 Follow a written procedure.
	10.06 Record data from evaluation activities.
	10.07 Document conclusions and solutions based on evaluation results, observations and data.
	10.08 Document progress using a project log.
	10.09 Write an abstract describing the project plan.
11.0	Demonstrate appropriate scientific content related to the project. The student will be able to:
	11.01 Document how types of motion may be described, measured, and predicted.
	11.02 Demonstrate how types of force that act on an object and the effect of that force can be described, measured, and predicted.
	11.03 Document how the principles of Human Computer Interface (HCI) are incorporated into the project design.
	11.04 Demonstrate how science, technology, and society are interwoven and interdependent.
12.0	Demonstrate appropriate mathematics content related to the project. The student will be able to:
	12.01 Identify different ways numbers are represented and used.
	12.02 Demonstrate proper use of the number systems.

CTE Standards and Benchmarks	
12.03	Develop effective operations on numbers and the relationships among these operations.
12.04	Use estimation in problem solving and computation.
12.05	Apply theories used in the solution to numbers.
12.06	Use quantities in the real world and uses the measures to solve problems.
12.07	Compare data within systems of measurement (both standard/nonstandard and metric/customary).
12.08	Solve mathematical problems using length, time, weight/mass, temperature, money, perimeter, area, and volume, and estimate the effects of measurement errors on calculations.
12.09	Apply appropriate units and instruments for measurement to achieve the degree of precision and accuracy required in real-world situations.
12.10	Describe, draw, Identify, and analyzes two-and three-dimensional shapes.
12.11	Visualize and illustrate ways in which shapes can be combined, subdivided, and changed.
12.12	Coordinate geometry to locate objects in both two and three dimensions and to describe objects algebraically.
12.13	Describe, analyze, and generalize a wide variety of patterns, relations, and functions.
12.14	Uses expressions, equations, inequalities, graphs, and formulas to represent and interpret situations.
12.15	Uses the tools of data analysis for managing information.
12.16	Identify patterns and makes predictions from an orderly display of data using concepts of probability and statistics.
12.17	Uses statistical methods to make inferences and valid arguments about real-world situations.
13.0	Research content related to the project and document the results. The student will be able to:
13.01	Identify the basic research needed to develop the project plan.
13.02	Identify available resources for completing background research required in the project plan.
13.03	Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources.
13.04	Demonstrate the ability to organize information retrieval.
13.05	Demonstrate the ability to prepare a topic outline.
13.06	Write a draft of the research report.
13.07	Use proper form for a bibliography, footnotes, quotations, and references to edit and proof the research report.
13.08	Prepare an electronically composed research paper in proper form.
13.09	Conduct an alpha and beta evaluation of the project’s product.
13.10	Write a report on the evaluations, documenting results, data, observations, and design changes based on the results.

CTE Standards and Benchmarks	
14.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
14.01	Prepare a multi-media presentation on the completed project.
14.02	Make an oral presentation, using multi-media materials.
14.03	Review the presentation, and make changes in the delivery method(s) to improve presentation skills.
15.0	Demonstrate competency in the area of expertise related to the Game, Simulation & Animation education program previously completed that this project is based upon. The student will be able to:
15.01	Demonstrate a mastery of the content of the selected subject area.
15.02	Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
15.03	Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.
15.04	Demonstrate the acquisition of additional knowledge, skill and experience in one area of the selected field of study beyond the performance standards of the initial program standards.

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Geospatial/Geographic Information Systems (GIS) Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	8600200
CIP Number	0545070214
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, FL-TSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

***Special Note**-- Any CTE Coverage suitable for Secondary or Postsecondary implementation accompanied by industry-recognized GIS Technician certification in accordance with 1012.39, F.S.*

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic benchmarks and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

This program is designed to prepare students for employment as a GIS Technology Assistant or a GIS Technician. Students are introduced to the concepts of Geospatial/Geographic Information System (GIS) and Remote Sensing (RS) Technology — an organized collection of computer hardware, specialized software, and geographic data designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced (spatial) information. Students will research and learn detailed information about global and local matters related to political, environmental, commercial, and other areas, through the use of specialized geospatial tools and products.

This program offers a broad foundation of core knowledge, transferable skills, and applications to prepare students for future careers as skilled GIS professionals. As GIS is a rapidly developing field, GIS professionals are in high demand and this program will prepare students for entry into the field. The content of this program includes the development of the following computer skills and concepts: computer application skills (e.g., word processing, spreadsheet, presentation, and desktop publishing), Internet browser applications, computer programming, advanced web tools, and

basic concepts of relational databases and the tools to use them. Additionally, this program stresses understanding and demonstration of GIS concepts, project management strategies, applications of geographic data elements and remotely sensed data, visualizations of spatial data, data inventory management, demographic and economic data analysis, data collection methods and techniques, and extensive exploration of GIS careers and job opportunities.

Additional Information relevant to this Career and Technical Education (CTE) program at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8600260	Introduction to GIS/RS Technology	BUS ED 1 @2 COMPU SCI 6 ENG&TEC ED1@2 TEC ED 1 @2 TEC EN AID @7 G *Any CTE Coverage suitable for Secondary or Postsecondary implementation accompanied by industry-recognized GIS Technician certification in accordance with 1012.39, F.S.*	1 credit	15-1199	2	CT
8600270	Essential GIS/RS Tools and Processes		1 credit	15-1199	2	CT
8600280	GIS/RS Analysis and Modeling		1 credit	15-1199	2	CT
8600290	Advanced GIS/RS Applications		1 credit	15-1199	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Program Implementation

This program emphasizes the development of abilities and/or awareness necessary to function in a highly technological society. The use of cooperative learning groups is recommended. By learning and practicing group process skills, students will be prepared to work "together" in real work situations. Program graduates will develop enhanced self-esteem as well as the problem-solving and teamwork skills necessary to succeed in careers and postsecondary education. Students will gain knowledge about career paths, have access to business role models, and have choices they would not otherwise have.

The Geospatial/Geographic Information Systems (GIS) Technology program places a strong emphasis on workplace learning. Shadowing and mentoring experiences with GIS professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.

Although a variety of GIS software applications and utilities are available in industry, the standards specified in this program focus on the underlying functions and associated competencies in alignment with the STARS program (www.digitalquest.com).

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform general computer application activities.
02.0 Design and prepare multi-view drawings.
03.0 Understand the history, societal implications, underlying theories and industry applications of GIS technology.
04.0 Understand map types, purposes, and information they depict.
05.0 Demonstrate an understanding of coordinate systems, projections, scale, orthorectified imagery, earth geometry and geodesy and other concepts integral to geographic information systems.
06.0 Create, change, validate and manipulate data used to create a map.
07.0 Demonstrate language arts knowledge and skills.
08.0 Demonstrate mathematics knowledge and skills.
09.0 Demonstrate science knowledge and skills.
10.0 Customize the display of geospatial data.
11.0 Manage, query and symbolize geospatial data.
12.0 Create a geospatial model.
13.0 Introduction to data collection and uses.
14.0 Layout and print maps.
15.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
16.0 Solve problems using critical thinking skills, creativity and innovation.
17.0 Use information technology tools.
18.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems and the larger environment.
19.0 Describe the importance of professional ethics and legal responsibilities.
20.0 Create surface models of spatial data to map distance.
21.0 Demonstrate density models of spatial data.
22.0 Demonstrate different surface interpolation methods.
23.0 Demonstrate different surface analysis methods.
24.0 Use different statistical methods in raster analysis.
25.0 Interpret different types of spatial data used in 3D visualization and analysis.
26.0 Create network datasets using existing shapefiles and geodatabases.
27.0 Demonstrate the importance of health, safety and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
28.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
29.0 Explain the importance of employability skill and entrepreneurship skills.
30.0 Create a 3D map using a GPS unit for use in a class wide project.
31.0 Create an extensive campus-based geospatial project.
32.0 Design an individual career plan that reflects the transition from school to work, lifelong learning, personal and professional goals.

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to GIS/RS Technology**
Course Number: **8600260**
Course Credit: **1**

Course Description:

While learning about the basics from the evolution of maps and projections, to learning about the modern uses of a geographic information system, students will complete many “hands-on” activities such as creating maps using compasses, rulers and tape measures. Specific areas of focus for this course include fundamental GIS and remote sensing concepts, project management strategies and essential basic computer skills. Students will acquire a basic understanding of geographic terms and concepts necessary for the appropriate use of GIS, including concepts of spatial variables, scale, map projection and map coordinate systems. Students will also be exposed to the history of GIS, how GIS fits into overall information management systems and a variety of applications in which GIS can contribute to analysis and decision-making. They will also use a software application used to simulate satellite movements and utilize data, imagery and GIS software to study their state, county and school campus.

This hands-on course provides step by step instructions that will take the student from learning the basics of these programs; like launching a map, viewing and editing metadata, to creating new GIS dataset, and eventually to creating a layout representation of data that the students download from the Internet. While learning these valuable skills, students will be using the same geospatial tools that GIS Technicians in the industry are using.

CTE Standards and Benchmarks	
01.0	Perform general computer application activities. The student will be able to:
01.01	Develop keyboarding skills to enter and manipulate text and data.
01.02	Demonstrate basic computer file management skills.
01.03	Use reference materials such as on-line help, vendor bulletin boards, tutorials and manuals available for application software.
01.04	Use spreadsheet, presentation software and integrated software packages to enhance communication.
01.05	Use computer networks (e.g., Internet, on-line databases) to facilitate collaborative or individual learning and communication.
01.06	Use computers to access, retrieve, organize, process, maintain, interpret and evaluate data and information.
01.07	Prepare presentation graphics.
01.08	Apply geometric construction techniques.
02.0	Design and prepare multi-view drawings. The student will be able to:
02.01	Analyze challenges and identify solutions for design problems.

CTE Standards and Benchmarks	
	02.02 Investigate the use of space, scale and environmental features to create three-dimensional form or the illusion of depth and form.
	02.03 Prepare multi-view scaled drawings or maps.
	02.04 Select proper drawing scale, views and layout.
	02.05 Prepare drawings containing horizontal and vertical surfaces.
	02.06 Prepare drawings containing circles and/or arcs.
	02.07 Prepare detail drawings.
	02.08 Draw a site plan.
03.0	Understand the history, societal implications, underlying theories and industry applications of GIS technology. The student will be able to:
	03.01 Discuss the history and societal implications of mapping and GIS.
	03.02 Describe the underlying theories of GIS.
	03.03 Identify industry applications for GIS technology.
04.0	Understand map types, purposes, and information they depict. The student will be able to:
	04.01 Compare and contrast various forms of maps in terms of purpose, information and application.
	04.02 Convert latitude and longitude information between DMS and DD forms.
	04.03 Demonstrate how to read a topographical map.
	04.04 Identify different types of maps.
	04.05 List the major elements of maps.
	04.06 Calculate straight line distances on the earth from latitudes and longitudes.
05.0	Demonstrate an understanding of coordinate systems, projections, scale, orthorectified imagery, earth geometry and geodesy and other concepts integral to geographic information systems. The student will be able to:
	05.01 Identify terminology associated with map coordinate systems and location, map scale, map projections and orienteering.
	05.02 Discuss the roles of several geometric approximations of the earth’s shape, such as geoids, ellipsoids and spheres.
	05.03 Describe characteristics of appropriate uses of common geospatial coordinate systems, such as geographic (latitude and longitude), UTM and State Plane coordinates.
	05.04 Interpret location using the Geographic Coordinate System to identify absolute location.
	05.05 Explain, interpret and describe the characteristics and uses of common map datum and projections.
	05.06 Explain the Universe Transverse Mercator (UTM) coordinate system.
	05.07 Interpret locations using the UTM coordinate system.

CTE Standards and Benchmarks	
	05.08 Demonstrate an understanding of how maps are created using aerial photography.
	05.09 Explain the State Plane Coordinate System (SPC).
	05.10 Interpret locations using the SPC system.
	05.11 Convert data between different datums and projections.
	05.12 Explain the difference between aerial and orthorectifed images.
06.0	Create, change, validate and manipulate data used to create a map. The student will be able to:
	06.01 Identify sources of GIS information and their applicability to GIS projects.
	06.02 Identify the primary components of the GIS Project Management Model.
	06.03 Discuss the elements of geospatial data quality including geometric accuracy thematic accuracy, resolution, precision and fitness for use.
	06.04 Create and customize a localized satellite map scenario using an appropriate GIS software application.
	06.05 Demonstrate the use of zooming, identifying, bookmarks, selecting and panning tools.
	06.06 Utilize a GPS unit to collect waypoints, measure distance and calculate area.
	06.07 Explain the components of the map display and the tools in the tool bars of common mapping software.
	06.08 Explain the need for and uses of metadata.
	06.09 Demonstrate geocoding addresses, editing symbols, clipping data layers and creating buffers.
	06.10 Demonstrate various styles of displaying symbols of data, sorting querying and selection techniques.
	06.11 Demonstrate editing feature data.
	06.12 Demonstrate how to georeference an Image Data Layer and add Control Points.
07.0	Demonstrate language arts knowledge and skills. The student will be able to:
	07.01 Locate, comprehend and evaluate key elements of oral and written information.
	07.02 Draft, revise and edit written documents using correct grammar, punctuation and vocabulary.
	07.03 Present information formally and informally for specific purposes and audiences.
08.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	08.01 Demonstrate knowledge of arithmetic operations.
	08.02 Analyze and apply data and measurements to solve problems and interpret documents.
	08.03 Construct charts/tables/graphs using functions and data.

CTE Standards and Benchmarks	
09.0	Demonstrate science knowledge and skills. The student will be able to:
09.01	Discuss the role of creativity in constructing scientific questions, methods and explanations.
09.02	Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.
09.03	Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
09.04	Present information formally and informally for specific purposes and audiences.

Florida Department of Education
Student Performance Standards

Course Title: **Essential GIS/RS Tools and Processes**
Course Number: **8600270**
Course Credit: **1**

Course Description:

Students in this course will use their knowledge of mapping and cataloging to complete numerous geospatial applications. They will learn techniques in displaying, managing, querying, symbolizing and create geospatial data. Students will learn the skills required to work on and/or build advanced GIS projects.

Students will follow a course of hands-on instruction to learn advanced skills ranging from introductory spatial analysis to examining spatial relationships within a specified area. Additionally, they will study site suitability to using three-dimensional data generating software to gain a different perspective of their environment by modeling surfaces. Students will use scenarios to map features and study relationships that exist in their local community.

Students will use remote sensing applications and data to develop skills that will allow them to convert the images to data that they will use for different types of analyses. The types of analyses will include image enhancement and analysis, feature extraction, vegetation mapping and change detection.

CTE Standards and Benchmarks	
10.0	Customize the display of geospatial data. The student will be able to:
10.01	Edit Layer Properties.
10.02	Create Layer Files.
10.03	Edit an attribute table by adding a new field with calculating values.
10.04	Perform relates and joins with data tables.
11.0	Manage, query, and symbolize geospatial data. The student will be able to:
11.01	Label features.
11.02	Insert, copy, and paste data into new data frames.
11.03	Create graphs and reports from data.
11.04	Demonstrate how to analyze land use, population and flood zone data.
11.05	Create geospatial data.

CTE Standards and Benchmarks	
	11.06 Symbolize a raster layer.
	11.07 Geocode addresses and resolve unmatched addresses.
	11.08 Use dissolve features, hyperlink, spatially join data, and create buffer functions.
	11.09 Demonstrate understanding of the conceptual foundations of which geographic information systems (GIS) are based, including the problem of representing change over time and the imprecision and uncertainty that characterizes all geographic information.
	11.10 Compare advantages and disadvantages of standard spatial data models, including the nature of vector, raster and object-oriented models, in the context of spatial data used in the workplace.
12.0	Create a geospatial model. The student will be able to:
	12.01 Create a geodatabase, import existing feature classes into a geodatabase, and import multiple feature classes to a geodatabase.
	12.02 Plan and build a local data inventory.
	12.03 Acquire and integrate a variety of field data, image data, vector data and attribute data to create, update and maintain GIS databases.
13.0	Introduction to data collection and uses. The student will be able to:
	13.01 Explain spatial reference.
	13.02 Demonstrate how to georeference an Image Data Layer and add Control Points.
	13.03 Use geospatial software tools to perform basic GIS hardware and software capabilities, including real-time GPS/GIS mapping systems.
	13.04 Manipulate digital elevation models (DEM's) to create slope, aspect, view shed and hill shade layers.
	13.05 Register aerial photographs or satellite images to a specific geographical coordinate system.
14.0	Layout and print maps. The student will be able to:
	14.01 Demonstrate the ability to define page margins and parameters for printing a specific size.
	14.02 Demonstrate effective use of map elements that must be included in a map including title, author, data, legend, scale bar, north arrow.
	14.03 Demonstrate effective use of page space through map scale and frame size.
15.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	15.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	15.02 Locate, organize and reference written information from various sources.
	15.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	15.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	15.05 Apply active listening skills to obtain and clarify information.

CTE Standards and Benchmarks	
	15.06 Develop and interpret tables and charts to support written and oral communications.
	15.07 Exhibit public relations skills that aid in achieving customer satisfaction.
16.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	16.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	16.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	16.03 Identify and document workplace performance goals and monitor progress toward those goals.
	16.04 Conduct technical research to gather information necessary for decision-making.
17.0	Use information technology tools. The student will be able to:
	17.01 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email and internet applications.
	17.02 Employ computer operations applications to access, create, manage, integrate and store information.
	17.03 Employ collaborative/groupware applications to facilitate group work.
18.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems and the larger environment. The student will be able to:
	18.01 Describe the nature and types of business organizations.
	18.02 Explain the effect of key organizational systems on performance and quality.
	18.03 List and describe quality control systems and/or practices common to the workplace.
19.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	19.01 Evaluate and justify decisions based on ethical reasoning.
	19.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies.
	19.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	19.04 Interpret and explain written organizational policies and procedures.
	19.05 Compare benefits and shortcomings of desktop, server, enterprise, and hosted (cloud) software applications.
	19.06 Discuss trends in geospatial technology and applications.

Florida Department of Education
Student Performance Standards

Course Title: GIS/RS Analysis and Modeling
Course Number: 8600280
Course Credit: 1

Course Description:

This course covers Surface Analysis, 3D modeling, and working with street networks.

This course directs students through five types of applications in Surface Analysis. It focuses on the various methods and uses of displaying continuous, or grid, data over a surface. Students will be expected to map data such as elevation, rainfall and temperature – data that differs from one location to the next on the surface of the earth. The five types of analyses used in this course are: mapping distance, density, interpolation, surface analysis and statistics. This course will conclude with a short project where student will use their newly acquired skills to perform surface analysis tasks to their local area.

There is a strong emphasis on students viewing their local area and the world in three dimensions. Students will learn skills such as viewing and displaying data, acquiring and processing data from online resources, displaying non-elevation data in 3D, applying surface analysis to 3D, adding raster and vector data, animating data and exporting projects.

Students will also explore in greater depth data layers previously studied in order to analyze the flow or navigation of networked data. They will also delve into the specifics of network analysis and examine how problems dealing with geospatial networks and routing may be found in the business world and in communities. The five types of network analyses covered in this course include Exploring Geospatial Networks, Finding the Best Route, Finding the Closest Facility, Determining Service Areas, and Modeling Real World Traffic Flow.

CTE Standards and Benchmarks	
20.0	Create surface models of spatial data to map distance. The student will be able to:
20.01	Create a straight line distance calculation.
20.02	Create a cost weighted distance calculation based on multiple inputs (costs).
20.03	Analyze an allocation grid created from a distance analysis calculation.
21.0	Demonstrate density models of spatial data. The student will be able to:
21.01	Identify different distance density calculation techniques.
21.02	Calculate density using both the kernel and simple calculation methods.
22.0	Demonstrate different surface interpolation methods. The student will be able to:
22.01	Create a surface from a set of features using the Inverse Distance Weighted interpolation method.

CTE Standards and Benchmarks	
	22.02 Create a surface from a set of features using the Spline interpolation method.
23.0	Demonstrate different surface analysis methods. The student will be able to:
	23.01 Create elevation contour data from an elevation raster.
	23.02 Calculate and display slope derived from an elevation raster.
	23.03 Determine and display aspect from an elevation raster.
	23.04 Create a hillshade surface from an elevation raster.
	23.05 Calculate the viewshed of a surface to determine visible objects.
	23.06 Calculate the cut/fill of a surface to estimate volume changes.
24.0	Use different statistical methods in raster analysis. The student will be able to:
	24.01 Calculate cell statistics using temporal raster grid data.
	24.02 Calculate neighborhood statistics and zonal statistics using raster grid data.
25.0	Interpret different types of spatial data used in 3D visualization and analysis. The student will be able to:
	25.01 Navigate various types of surfaces.
	25.02 Explore methods of obtaining, downloading and extracting free data using the Internet.
	25.03 Build 3D datasets.
	25.04 Display 2D features onto a 3D surface.
	25.05 Create shapefiles to view in a 3D environment.
	25.06 Construct a 3D model of an urban environment.
	25.07 Display georeferenced data measurements in 3D.
	25.08 Apply Interpolation methods.
	25.09 Utilize georeferenced 2D data in a 3D environment to provide valuable information.
	25.10 Create contour lines in a 3D environment.
	25.11 Search, select, and download public domain data and imagery from the Nation Elevation Dataset (NED).
26.0	Create network datasets using existing shapefiles and geodatabases. The student will be able to:
	26.01 Find the most efficient routes for multiple stops on a complex street network.
	26.02 Generate directions from one location to another using a street network.

CTE Standards and Benchmarks	
	26.03 Find the closest facility from a location on a complex street network.
	26.04 Define service areas using a street network based on travel time.
	26.05 Create an Origin-Destination Cost Matrix to communicate costs associated with travel from facilities to destinations in a geospatial network.
	26.06 Demonstrate modeling of real world traffic flow.
27.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	27.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	27.02 Explain emergency procedures to follow in response to workplace accidents.
	27.03 Create a disaster and/or emergency response plan.
28.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	28.01 Employ leadership skills to accomplish organizational goals and objectives.
	28.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	28.03 Conduct and participate in meetings to accomplish work tasks.
	28.04 Employ mentoring skills to inspire and teach others.
29.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	29.01 Identify and demonstrate positive work behaviors needed to be employable.
	29.02 Develop personal career plan that includes goals, objectives and strategies.
	29.03 Examine licensing, certification, and industry credentialing requirements.
	29.04 Maintain a career portfolio to document knowledge, skills and experience.
	29.05 Evaluate and compare employment opportunities that match career goals.
	29.06 Identify and exhibit traits for retaining employment.
	29.07 Identify opportunities and research requirements for career advancement.
	29.08 Research the benefits of ongoing professional development.
	29.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced GIS/RS Applications**
Course Number: **8600290**
Course Credit: **1**

Course Description:

This project-based, capstone course challenges students to apply all skills and techniques learned in the previous three courses to create their first extensive GIS project. In this project, students will work in teams to create a three-dimensional map of their campus using GIS tools. Once the base map is completed, each student selects one of the designated campus-based projects to complete. Students will be involved with all parts of the process including problem identification, data collection using GPS units, determining the appropriate type of analysis to be conducted or type of product to address the problem statement, performing the analysis, create their solution and formally presenting the project to interested stakeholders. Each project integrates project planning, geographic problem solving, GIS tools and software applications, project management, data creation, data manipulation, data analysis, reporting and presentations.

CTE Standards and Benchmarks	
30.0	Create a 3D map using a GPS unit for use in a class wide project. The student will be able to:
30.01	Demonstrate implementation of surface analysis, three dimension and networked data.
31.0	Create an extensive campus-based geospatial project. The student will be able to:
31.01	Create a campus inventory.
31.02	Plan a complete geospatial project.
31.03	Implement a campus-based geospatial project.
31.04	Organize project into an effective report including map layouts.
31.05	Present project using a written and/or oral report.
32.0	Design an individual career plan that reflects the transition from school to work, lifelong learning, personal and professional goals. The student will be able to:
32.01	Research, compare, and contrast GIS technology careers (e.g., characteristics needed, skills required, education required, industry certifications, advantages and disadvantages of GIS technology careers, the need for GIS technology workers).
32.02	Describe the variety of occupations and professions within the world of GIS technology including those where information technology is either in a primary focus or in a supportive role.
32.03	Describe job requirements for the variety of occupations and professions within the global world of GIS technology.
32.04	Analyze personal skills and aptitudes in comparison with GIS technology career opportunities.

CTE Standards and Benchmarks	
32.05	Refine and implement a plan to facilitate personal growth and skill development related to GIS technology career opportunities.
32.06	Develop and maintain an electronic career portfolio, to include, but not limited to the Resume and Letter of Application.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

No new students may be enrolled in this program starting 2026-27. The last year to report any enrollment is 2026-27. This program can be substituted with Mentored Industry Project 9601200 (1032011101) or School-Based Enterprise 9601300 (1052070100).

Course Title: **Information Technology Directed Study**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Course Number	9000100
CIP Number	0511999901
Grade Level	11-12
Course Length	1 credit – Multiple credits
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA, FL-TSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to provide students with learning opportunities in a prescribed program of study within the Information Technology cluster that will enhance opportunities for employment in the career field chosen by the student.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course Structure

The content is prescribed by the instructor based upon the individual student's assessed needs for directed study.

This course may be taken only by a student who has completed or is currently completing a specific secondary job preparatory program for additional study in this career cluster. A student may earn multiple credits in this course.

The selected standards and benchmarks, which the student must master to earn credit, must be outlined in an instructional plan developed by the instructor.

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary course structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
9000100	Information Technology Directed Study	BUS ED 1 @2 INFO TECH 7G WEB DEV 7G COMP PROG 7G COMPU SCI 6 CYBER TECH 7G DIGI MEDIA 7G	1 credit – Multiple credits	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate expertise in a specific occupation contained within the career cluster.
02.0 Conduct investigative research on a selected topic related to the career cluster using approved research methodology, interpret findings, and prepare presentation to defend results.
03.0 Apply enhanced leadership and professional career skills.
04.0 Demonstrate higher order critical thinking and reasoning skills appropriate for the selected program of study.

Florida Department of Education
Student Performance Standards

Course Title: **Information Technology Directed Study**
Course Number: **9000100**
Course Credit: **1**

CTE Standards and Benchmarks	
01.0	Demonstrate expertise in a specific occupation within the career cluster. The student will be able to:
01.01	The benchmarks will be selected from the appropriate curriculum frameworks and determined by the instructor based upon the individual students assessed needs.
02.0	Conduct investigative research on a selected topic related to the career cluster using approved research methodology, interpret findings, and prepare presentation to defend results. The student will be able to:
02.01	Select investigative study referencing prior research and knowledge.
02.02	Collect, organize and analyze data accurately and precisely.
02.03	Design procedures to test the research.
02.04	Report, display and defend the results of investigations to audiences that may include professionals and technical experts.
03.0	Apply enhanced leadership and professional career skills. The student will be able to:
03.01	Develop and present a professional presentation offering potential solutions to a current issue.
03.02	Enhance leadership and career skills through work-based learning including job placement, job shadowing, entrepreneurship, internship, or a virtual experience.
03.03	Participate in leadership development opportunities available through the appropriate student organization and/or other professional organizations.
03.04	Enhance written and oral communications through the development of presentations, public speaking, and live and/or virtual interviews.
04.0	Demonstrate higher order critical thinking and reasoning skills appropriate for the selected program of study. The student will be able to:
04.01	Use mathematical and/or scientific skills to solve problems encountered in the chosen occupation.
04.02	Read and interpret information relative to the chosen occupation.
04.03	Locate and evaluate key elements of oral and written information.
04.04	Analyze and apply data and/or measurements to solve problems and interpret documents.
04.05	Construct charts/tables/graphs using functions and data.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

A learning laboratory is provided as required to support the educational activities of the student. This laboratory may be in the traditional classroom, in an industry setting, or a virtual learning environment.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

No new students may be enrolled in this program starting 2026-27. The last year to report any enrollment is 2026-27. This program was replaced by Cooperative Education On-the-Job Training (OJT) 9601500 (1032011103).

Course Title: **Information Technology Cooperative Education – OJT**
Course Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Cooperative Education – OJT	
Course Number	9000420
CIP Number	05119999CP
Grade Level	9-12
Course Length	Multiple credits
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology cluster.

Each student job placement must be related to the job preparatory program in which the student is enrolled or has completed.

The purpose of this course is to provide the on-the-job training component when the **cooperative method of instruction** is appropriate. Whenever the cooperative method is offered, the following is required for each student: a training agreement; a training plan signed by the student, teacher and employer, including instructional objectives; a list of on-the-job and in-school learning experiences; a workstation which reflects equipment, skills and tasks which are relevant to the occupation which the student has chosen as a career goal; and a site supervisor with a working knowledge of the selected occupation. The workstation may be in an industry setting or in a virtual learning environment. The student **must be compensated** for work performed.

The teacher/coordinator must meet with the site supervisor a minimum of once during each grading period for the purpose of evaluating the student's progress in attaining the competencies listed in the training plan.

Information Technology Cooperative Education – OJT may be taken by a student for one or more semesters. A student may earn multiple credits in this course. The specific student performance standards which the student must achieve to earn credit are specified in the Cooperative Education – OJT Training Plan.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course Structure

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary course structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
9000420	Information Technology Cooperative Education – OJT	BUS ED 1 @2 INFO TECH 7G WEB DEV 7G COMP PROG 7G CYBER TECH 7G DIGI MEDIA 7G	Multiple Credits	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform designated job skills.
02.0 Demonstrate work ethics.

Florida Department of Education
Student Performance Standards

Program Title: **Information Technology Cooperative Education – OJT**
Secondary Number: **9000420**

Standards and Benchmarks	
01.0	Perform designated job skills. The student will be able to:
01.01	Perform tasks as outlined in the training plan.
01.02	Demonstrate job performance skills.
01.03	Demonstrate safety procedures on the job.
01.04	Maintain appropriate records.
01.05	Attain an acceptable level of productivity.
01.06	Demonstrate appropriate dress and grooming habits.
02.0	Demonstrate work ethics. The student will be able to:
02.01	Follow directions.
02.02	Demonstrate good human relations skills on the job.
02.03	Demonstrate good work habits.
02.04	Demonstrate acceptable business ethics.

Additional Information

Special Notes

The **Cooperative Education Manual** is available on-line and has guidelines for students, teachers, employers, parents and other administrators and sample training agreements. It can be accessed on the DOE Website at http://fldoe.org/academics/career-adult-edu/career-tech-edu/additional-cte-programs-courses/diversified-edu.stml.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Web Development**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9001100
CIP Number	0511080104
Grade Level	9-12
Program Length	7 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1199 – Computer Occupations, All Other
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as an Assistant Web Designer, a Web Designer, and Senior Web Designer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to operating system commands and web document development, design, promotion and scripting.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven (7) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1199	2	CT
9001110	Foundations of Web Design	BUS ED 1 @2 VOE @7 TC COOP ED @7 BUS DP @7 %G ELECT DP @7 %G CLERICAL @7 7G SECRETAR 7G TEC ELEC $7 G COMP SCI 6 COMM ART @7 7G WEB DEV 7 G	1 credit	15-1199	3	CT
9001120	User Interface Design		1 credit	15-1199	3	CT
9001130	Web Scripting Fundamentals		1 credit	15-1199	3	CT
9001140	Media Integration Essentials		1 credit	15-1199	3	CT
9001150	E-commerce & Marketing Essentials		1 credit	15-1199	3	CT
9001160	Interactivity Essentials		1 credit	15-1199	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Demonstrate proficiency setting website project requirements during the design phase and project planning phase of web development.
11.0 Demonstrate proficiency creating a logical website file structure.
12.0 Create basic webpages that meet the industry standards as set forth by the W3C (World Wide Web Consortium).
13.0 Incorporate images and graphical formatting on a webpage.
14.0 Create a basic table structure.
15.0 Incorporate form structures in a webpage.
16.0 Discuss appropriate use of frame structures and their outdated usage.
17.0 Understand the basic principles of Cascading Style Sheets-CSS.
18.0 Use CSS to create basic webpages based on industry standards.
19.0 Develop website page layout using AP (Absolute Positioning) elements.
20.0 Examine web design technologies and techniques.
21.0 Describe the process for publishing a website.
22.0 Describe how website performance is monitored and analyzed.
23.0 Create an informational website that conforms to industry standards as set forth by the W3C.
24.0 Demonstrate efficient, consistent website development practice (use of templates, snippets).
25.0 Demonstrate language arts knowledge and skills.
26.0 Demonstrate mathematics knowledge and skills.
27.0 Incorporate Human Computer Interface (HCI) principles of design.
28.0 Research and obtain information for use in designing the user interface.
29.0 Create a user friendly interface using Cascading Style Sheets (CSS).
36.0 Create a CSS formatted informational website.
37.0 Demonstrate proficiency publishing, testing, monitoring, and maintaining a website.
38.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
39.0 Solve problems using critical thinking skills, creativity and innovation.

40.0 Describe the roles within teams, work units, larger environment as it relates to website project management.
41.0 Describe the importance of professional ethics and legal responsibilities as it relates to website development.
42.0 Discuss the differences between server-side and client-side scripting.
43.0 Demonstrate understanding of the Document Object Model (DOM).
44.0 Design, write, debug, and incorporate a JavaScript client-side script into a webpage.
45.0 Incorporate basic JavaScript form validation and form handling (using pre-built validation scripts or online libraries).
46.0 Use advanced JavaScript techniques.
47.0 Demonstrate understanding of JavaScript accessibility issues.
48.0 Select and modify appropriate library and pre-built JavaScript to incorporate into webpage.
49.0 Demonstrate understanding of XML vocabularies and documents.
50.0 Create and debug an XML Document.
51.0 Demonstrate an understanding of Asynchronous JavaScript and XML (AJAX) and its implications for web developers.
52.0 Plan and implement a multi-page website using AJAX techniques.
53.0 Incorporate Canvas API methods into a webpage.
54.0 Demonstrate an understanding of PHP scripting.
55.0 Design, write, debug, and incorporate a PHP client-side script into a webpage.
56.0 Demonstrate an understanding of databases.
57.0 Incorporate a database into a webpage.
58.0 Demonstrate knowledge and skills necessary to setup a secure E-commerce site.
59.0 Identify security issues associated with E-commerce and discuss methods to mitigate risks.
60.0 Apply skills necessary to setup an E-commerce storefront.
61.0 Employ techniques to enhance the value and profitability of an E-commerce website.
62.0 Develop evaluation and performance monitoring metrics and target goals for an E-commerce website.
63.0 Demonstrate an understanding of Content Management Systems (CMS) and their implications for web development.
64.0 Use CMS features, functions, and extensions/modules to create/enhance a website.
65.0 Evaluate the suitability for and system requirements for a content management system.
66.0 Demonstrate an understanding of multimedia applications and their implications for web designers.
67.0 Create and incorporate interactive website components.
68.0 PDF document usage considerations.
69.0 Create, format, and manipulate PDF documents.
70.0 Display, distribution, and print considerations for PDF documents.
71.0 Create and manage PDF forms.
72.0 Incorporate PDF security in a PDF document.
73.0 Demonstrate proficiency using HTML5 features and functions.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Web Design**
Course Number: **9001110**
Course Credit: **1**

Course Description:

This course is designed to provide students with opportunities to acquire and apply foundational skills related to web design.

CTE Standards and Benchmarks	
10.0	Demonstrate proficiency setting website project requirements during the design phase and project planning phase of web development. The student will be able to:
10.01	Define information architecture.
10.02	Discuss the importance of information architecture to web design and development.
10.03	Conduct a client interview to determine the business purpose and needs.
10.04	Conduct a competitive analysis.
10.05	Describe the activities performed during the design phase and project planning phase of website development.
10.06	Demonstrate basic design principles (e.g., use of colors, proximity, rule of thirds, white space in the design of a website).
10.07	Define the site structure by creating a content map, site map, storyboard, associated wireframes, and web design comp for client approval.
10.08	Analyze and evaluate global site maps.
10.09	Discuss the legal and ethical issues (e.g., copyright laws, obtaining permission, public domain, proper citations) related to web design.
10.10	Describe accessibility and its implications on web design.
10.11	Identify the client and target audience needs, as well as the purpose of a website.
10.12	Describe project management responsibilities.
10.13	Define website project scope and scope creep.
10.14	Determine deadlines and deliverables for a website project.
10.15	Discuss Americans with Disabilities Act (ADA) standards for accessibility.
11.0	Demonstrate proficiency creating a logical website file structure. The student will be able to:
11.01	Create an efficient, maintainable directory structure for a website, including the site root and subfolders for assets (e.g., images, templates, CSS).

CTE Standards and Benchmarks	
	11.02 Demonstrate and use correct file paths for relative, site root relative, and absolute links.
	11.03 Apply acceptable and logical website file naming conventions (e.g., index.html, comments.htm, about_us.htm).
	11.04 Examine emerging and new markup languages.
	11.05 Determine browser or platform compatibility as it relates to webpage design.
	11.06 Identify common DOCTYPES (e.g., Strict, Transitional and Frameset, and HTML5) and describe their appropriate use.
	11.07 Understand the purpose and placement of Metadata in a website.
12.0	Create basic webpages that meet the industry standards as set forth by the W3C (World Wide Web Consortium). The student will be able to:
	12.01 Create basic webpage structures using common markup elements and attributes.
	12.02 Incorporate list structures in a webpage (e.g., ordered, unordered, definition).
	12.03 Incorporate hyperlinks in a webpage (e.g., external, internal, email, named anchors, id Attribute).
	12.04 Describe the influence of the W3C in the web development industry.
	12.05 Write proper webpage syntax using tags and attributes that meet the standards set forth by the W3C.
	12.06 Incorporate common webpage elements and attributes in a webpage (e.g., title, comment tags, id).
	12.07 Differentiate between absolute and relative links used in a webpage.
	12.08 Define and incorporate the target attribute for hyperlinks suitable for its purpose.
	12.09 Use the HTML AUDIO and VIDEO tags to display a media file on the webpages.
13.0	Incorporate images and graphical formatting on a webpage. The student will be able to:
	13.01 Describe usage guidelines (e.g., format types, size, relevance) for integrating images and graphics onto a webpage.
	13.02 Compare and contrast standard image formats used in webpage design.
	13.03 Incorporate graphics into a webpage design.
	13.04 Create and incorporate image maps in a webpage.
	13.05 Optimize images and graphics for use in a webpage.
14.0	Create a basic table structure. The student will be able to:
	14.01 Describe how tables are used in web design.
	14.02 Discuss the advantages and disadvantages of incorporating tables in a webpage design.
	14.03 Define and modify table structures for the presentation of tabular information.

CTE Standards and Benchmarks	
	14.04 Create accessible tables using standard table elements and attributes.
15.0	Incorporate form structures in a webpage. The student will be able to:
	15.01 Create an accessible form using common elements, including form, fieldset, legend, textarea, select, option, button, labels, and input (radio, checkbox, submit, reset, image, password, hidden).
	15.02 Describe and diagram the relationship between HTML forms and server-side technologies.
	15.03 Compare and contrast the GET and POST methods for forms handling.
	15.04 Define form validation and describe how it is accomplished.
	15.05 List popular server-side technologies often used to process content sent from HTML forms.
	15.06 Connect a HTML form to a server-side script for processing.
16.0	Discuss appropriate use of frame structures and their outdated usage. The student will be able to:
	16.01 Discuss using frames and iframe structures and the related security vulnerabilities.
	16.02 Describe appropriate uses of iframes.
17.0	Understand the basic principles of Cascading Style Sheets-CSS. The student will be able to:
	17.01 Define the purpose of CSS and describe its importance in web design.
	17.02 Discuss existing and emerging CSS versions.
	17.03 Explain how inheritance and specificity affect CSS rule conflicts.
	17.04 Discuss the different placement of CSS (e.g., inline, external, embedded).
18.0	Use CSS to create basic webpages based on industry standards. The student will be able to:
	18.01 Recognize and use element selectors, ID selectors, class selectors, pseudo-class selectors, and descendant selectors.
	18.02 Explain how inheritance and specificity affect CSS rule conflicts.
	18.03 Use inline, internal and external style sheets.
	18.04 Use the link and import methods to connect to an external style sheet.
	18.05 Apply basic CSS properties (background, border, color, float, font, height, line-height, list-style, margin, overflow, padding, text-align, text-indent, width, padding).
	18.06 Use CSS to style tables (e.g., borders, width, spacing, alignment, background).
	18.07 Use CSS to enhance the appearance and usability of an HTML form.
19.0	Develop website page layout using AP (Absolute Positioning) elements. The student will be able to:
	19.01 Compare and contrast positioning types on a webpage.

CTE Standards and Benchmarks	
	19.02 Describe the usage of AP elements in a webpage.
	19.03 Incorporate AP elements in a webpage layout using appropriate Div tags.
	19.04 Discuss the benefits and drawbacks of using AP elements for webpage layouts.
	19.05 Determine how the stacking order and z-index impact webpages created with AP elements.
20.0	Examine web design technologies and techniques. The student will be able to:
	20.01 Discuss client-side and server-side technologies.
	20.02 Define e-commerce types and usage.
	20.03 Describe database connectivity relative to websites.
21.0	Describe the process for publishing a website. The student will be able to:
	21.01 Explore domain name selection process.
	21.02 Identify process to registering a domain name.
	21.03 Compare and contrast hosting providers, features, and selection criteria.
	21.04 Describe the various means for uploading website files (e.g., FTP, web-based tools).
22.0	Describe how website performance is monitored and analyzed. The student will be able to:
	22.01 Identify issues related to website maintenance.
	22.02 Use webpage validation tools.
	22.03 Describe website performance metrics (e.g., visits, time-on-page, time-on-site) and discuss their design implications.
	22.04 Demonstrate knowledge of accessibility problems and solutions.
	22.05 Discuss current basic Search Engine Optimization techniques.
	22.06 Explore common website analytic tools.
23.0	Create an informational website that conforms to industry standards as set forth by the W3C. The student will be able to:
	23.01 Use GUI (Graphical User Interface) web authoring software to create a multi-page informational website.
	23.02 Use image-editing software to enhance website designs with simple graphics.
	23.03 Use animation software to enhance website designs.
	23.04 Enhance the website using client-side technologies (navigation bars, rollover images or text, check plug-ins).
24.0	Demonstrate efficient, consistent website development practice (use of templates, snippets). The student will be able to:

CTE Standards and Benchmarks	
	24.01 Produce website designs that would work equally well on various operating systems and platforms, browser versions/configurations, and devices.
	24.02 Describe various file formats that can be imported onto a website (tabular data, word processing, presentation, PDFs).
25.0	Demonstrate language arts knowledge and skills. The student will be able to:
	25.01 Locate, comprehend and evaluate key elements of oral and written information.
	25.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
	25.03 Present information formally and informally for specific purposes and audiences.
26.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	26.01 Demonstrate knowledge of arithmetic operations.
	26.02 Analyze and apply data and measurements to solve problems and interpret documents.
	26.03 Construct charts/tables/graphs using functions and data.

Florida Department of Education
Student Performance Standards

Course Title: **User Interface Design**
Course Number: **9001120**
Course Credit: **1**

Course Description:

This course provides advanced concepts used in interface design. The content includes principles of Human Computer Interface (HCI), advanced page design using Cascading Style Sheets (CSS), advanced HTML commands, multimedia applications, Internet/Intranet tools, and website promotion.

CTE Standards and Benchmarks	
27.0	Incorporate Human Computer Interface (HCI) principles of design. The student will be able to:
27.01	Describe the fundamental design principles of human computer interface.
27.02	Differentiate between computer and human factors in screen/page design.
27.03	Describe what is meant by an “intuitive” interface.
27.04	Describe how typography, color scheme, and graphic usage are used to set website feel/tone for various types of websites (e.g., educational, entertainment, ecommerce).
27.05	Identify and use the following design concepts: contrast, repetition, alignment, proximity, writing style.
27.06	Define and establish logo, identity, and branding needed for an effective website.
27.07	Evaluate the HCI features included on a webpage storyboard.
27.08	Create a series of webpage storyboards that incorporate HCI design principles.
28.0	Research and obtain information for use in designing the user interface. The student will be able to:
28.01	Identify common user information needs, information gathering models, and methods for gathering user research.
28.02	Define the primary audience and customer expectations.
28.03	Describe target audience preferences based on demographics (e.g., gender, age, economic status, culture).
28.04	Identify and use web analytic tools to shape an information architecture strategy (determine keywords).
28.05	Apply the results of research and analytics to the design of a user interface.
29.0	Create a user friendly interface using Cascading Style Sheets (CSS). The student will be able to:
29.01	Create CSS styles suitable for use on a user friendly webpage interface.

CTE Standards and Benchmarks	
	29.02 Use element selectors, ID selectors, class selectors, pseudo-class selectors, and descendant selectors to create a table-less webpage design.
	29.03 Create a series of templates formatted exclusively using CSS.
	29.04 Use CSS syntax to configure and apply style sheets for multiple media displays (e.g., screen display and print).
	29.05 Use CSS syntax to implement custom web fonts on a webpage.
	29.06 Use CSS syntax to implement transitions and transformations to create animations on a webpage.
	29.07 Use CSS media queries to develop a responsive user interface.
	29.08 Explore various web authoring software (e.g., text editor or GUI editors).
	29.09 Create documented CSS style sheets for layout and appearance purposes.
30.0	Create a CSS formatted informational website. The student will be able to:
	30.01 Use GUI (Graphical User Interface) web authoring software to create a multi-page informational website.
	30.02 Create documented CSS style sheets for layout and appearance purposes.
	30.03 Incorporate methods used to drive traffic to the website, then engage and retain visitors.
	30.04 Apply standard search engine optimization (SEO) practices (e.g., keyword proximity; density; relevance; appropriate page titles, URLs, and headings, alt tags) to enhance search engine performance.
	30.05 Use standard design techniques to create websites and correct display issues using multiple browsers and platforms.
	30.06 Discuss the pros and cons of using existing and emerging animation software.
	30.07 Use client-side technologies such as rollovers, check plug-ins, and pop-up windows to enhance the user interface.
31.0	Demonstrate proficiency publishing, testing, monitoring, and maintaining a website. The student will be able to:
	31.01 Recognize the relationship between local and remote site structure.
	31.02 Identify methods of acquiring a domain name, appropriate hosting, and search engine registry.
	31.03 Understand and implement strategies to measure website traffic and improve search engine analytics reports.
	31.04 Describe the use of standard web marketing techniques.
	31.05 Describe how social media and social networking sites can be used for marketing purposes.
	31.06 Test websites using common resolutions, browsers, accessibility, and validation techniques.
	31.07 Use popular Internet browsers and tools as defined by W3C Browser Statistics (e.g., Mozilla Firefox (Web Developer Toolbar, ColorZilla, MeasureIt, Firebug), Internet Explorer 7/8) to display and troubleshoot websites.
	31.08 Explore standard practices for feedback and usability testing.

CTE Standards and Benchmarks	
	31.09 Identify and incorporate standard security measures in a website.
	31.10 Identify and use online validation tools.
	31.11 Change invalid markup to comply with standards.
	31.12 Build a webpage that successfully passes the W3C validation test at http://validator.w3.org .
	31.13 Write markup that facilitates accessibility.
	31.14 Understand how to publish sites to remote server.
	31.15 Differentiate between local, testing, and remote website files and storage.
32.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	32.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	32.02 Locate, organize and reference written information from various sources.
	32.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	32.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	32.05 Apply active listening skills to obtain and clarify information.
	32.06 Develop and interpret tables and charts to support written and oral communications.
	32.07 Exhibit public relations skills that aid in achieving customer satisfaction.
33.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	33.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	33.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	33.03 Identify and document workplace performance goals and monitor progress toward those goals.
	33.04 Conduct technical research to gather information necessary for decision-making.
34.0	Describe the roles within teams, work units, larger environment as it relates to website project management. The student will be able to:
	34.01 Describe the types of websites and the major processes that make them successful.
	34.02 Explain project management and team member key roles.
	34.03 List and describe project management control systems (i.e., scope, timeframe, deliverables).
	34.04 Explain the impact of the global economy and cultures on website planning and production.
35.0	Describe the importance of professional ethics and legal responsibilities as it relates to website development. The student will be able to:

CTE Standards and Benchmarks	
35.01	Evaluate and justify decisions based on ethical reasoning.
35.02	Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
35.03	Identify and explain personal and corporate consequences of unethical or illegal practices in website development.
35.04	Interpret and explain written organizational policies and procedures.

Florida Department of Education
Student Performance Standards

Course Title: **Web Scripting Fundamentals**
Course Number: **9001130**
Course Credit: **1**

Course Description:

This course provides an introduction to scripting related to web development. The content primarily focuses on client-side scripting using JavaScript.

CTE Standards and Benchmarks	
36.0	Discuss the differences between server-side and client-side scripting. The student will be able to:
36.01	Describe the role scripting languages play in the creation of websites.
36.02	Identify and describe the advantages, disadvantages, and primary uses of popular scripting languages (e.g., JavaScript, VBScript, Perl, PHP, JScript).
37.0	Demonstrate understanding of the Document Object Model (DOM). The student will be able to:
37.01	Describe the purpose of the Document Object Model (layout, objects, properties, methods).
37.02	Describe how JavaScript uses the DOM to detect and manipulate elements on a webpage.
38.0	Design, write, debug, and incorporate a JavaScript client-side script into a webpage. The student will be able to:
38.01	Write, analyze and explain JavaScript syntax.
38.02	Describe usage of various data types.
38.03	Describe how the use of decision-making logic (AND, OR) is employed in a JavaScript program.
38.04	Create and use variables, operators, and expressions.
38.05	Use common JavaScript events and event handlers (e.g., click, load, onClick, onLoad) to control program flow, appearance, or functionality.
38.06	Understand and incorporate JavaScript arrays (e.g., array basics, types, usage, methods, sorting).
38.07	Understand and incorporate JavaScript functions (e.g., using the DOM, pass a value, return value, create objects, work with classes, objects).
38.08	Understand and incorporate JavaScript loops and conditions (e.g., loop basics, types, usage).
38.09	Recognize, isolate, and correct common JavaScript errors (e.g., syntax, function errors, reserved word usage, unsupported DOM).
38.10	Apply JavaScript best coding practices (i.e., properly documenting scripts, field naming conventions, writing understandable code).
38.11	Use different methods to incorporate JavaScript onto a webpage (e.g., <script> element, JavaScript statement block, external scripts).

CTE Standards and Benchmarks	
	38.12 Troubleshoot and test incorporated script (i.e., functionality, browser usage, resolve known bugs).
39.0	Incorporate basic JavaScript form validation and form handling (using pre-built validation scripts or online libraries). The student will be able to:
	39.01 Identify and use form elements to solicit user input.
	39.02 Use JavaScript with HTML form controls.
	39.03 Validate web forms prior to submission.
	39.04 Use output commands to display processed data in an appropriately formatted form.
40.0	Use advanced JavaScript techniques. The student will be able to:
	40.01 Write JavaScript suitable for plug-in detection, image manipulation, and the creation of custom JavaScript objects.
	40.02 Use JavaScript to incorporate, create, update, and delete cookies.
	40.03 Describe the common security issues relevant to JavaScript.
41.0	Demonstrate understanding of JavaScript accessibility issues. The student will be able to:
	41.01 Describe the purpose of the Browser Object Model (BOM) and how it relates to JavaScript.
	41.02 Describe how obsolete constructs and coding practices affect browser function.
	41.03 Make webpages accessible and functional when JavaScript is disabled or unsupported.
	41.04 Demonstrate ability to use HTML, HTML, and CSS instead of JavaScript where appropriate.
	41.05 Demonstrate ability to determine which version of JavaScript specific browsers support and code a program to meet acceptable standards.
42.0	Select and modify appropriate library and pre-built JavaScript to incorporate into webpage. The student will be able to:
	42.01 Explore common JavaScript libraries and describe the advantages and disadvantages of using libraries.
	42.02 Analyze pre-built library items to determine functionality.
	42.03 Explain how a library item achieves desired processing.
	42.04 Determine if pre-built script provides functionality required in an effective manner.
	42.05 Incorporate pre-built library items into webpages.
	42.06 Identify the restrictions related to using pre-built scripts (i.e., copyright, processing, and length of script).
	42.07 Modify pre-built scripts to suit functionality requirements.
	42.08 Test and troubleshoot pre-built scripts and widgets incorporated into webpages.

Florida Department of Education
Student Performance Standards

Course Title: **Media Integration Essentials**
Course Number: **9001140**
Course Credit: **1**

Course Description:

This course provides in-depth instruction into techniques for integrating various forms of media onto webpages, with particular focus on XML and AJAX technologies and frameworks. Students should have a good understanding of JavaScript prior to taking this course.

CTE Standards and Benchmarks	
43.0	Demonstrate understanding of XML vocabularies and documents. The student will be able to:
43.01	Understand XML vocabularies.
43.02	Define well-formed and valid XML documents.
43.03	Describe the basic structure of an XML document.
44.0	Create and debug an XML Document. The student will be able to:
44.01	Create an XML declaration.
44.02	Work with XML comments.
44.03	Create XML elements and attributes.
44.04	Work with character and entity references.
44.05	Describe how XML handles character data, parsed character data, and white space.
44.06	Work with XML parsers.
44.07	Understand how Web browsers work with XML documents.
44.08	Apply a style sheet to an XML document.
45.0	Demonstrate an understanding of Asynchronous JavaScript and XML (AJAX) and its implications for web developers. The student will be able to:
45.01	Identify the technologies that comprise AJAX and explain how they interact.
45.02	Describe the purpose, advantages, disadvantages, and functions of AJAX.
45.03	Describe how AJAX works and how it is used in the creation of websites.
45.04	Define appropriate use of AJAX in a web project.

CTE Standards and Benchmarks	
	45.05 Identify AJAX Usability and Accessibility issues and their workarounds.
	45.06 Describe AJAX related browser compatibility issues and their workarounds.
	45.07 Explore popular AJAX applications currently on the Internet (auto-complete (Google), updating user content (Twitter), voting and rating (social bookmarking).
	45.08 Describe common security issues associated to AJAX.
	45.09 Analyze the server-side implications of AJAX applications.
	45.10 Explore methods for testing and maintaining an AJAX application.
	45.11 Explore the future of AJAX and its implementation.
46.0	Plan and implement a multi-page website using AJAX techniques. The student will be able to:
	46.01 Research AJAX design principles and patterns (e.g., Observer, Command and MVC).
	46.02 Research and compare popular AJAX frameworks, libraries, and toolkits (e.g., JQuery, DOJO, Prototype).
	46.03 Identify and implement strategies for progressive enhancement of a webpage.
	46.04 Update specific areas of a page with data from the server (e.g., server-login updated) without reloading the webpage.
	46.05 Demonstrate the ability to transmit data in different formats (e.g., XML, JSON, alternatives to JavaScript).
	46.06 Use AJAX to create form submission and validation (e.g. password strength check, email/URL validation).
	46.07 Integrate a third party image gallery component.
47.0	Incorporate Canvas API methods into a webpage. The student will be able to:
	47.01 Use the HTML CANVAS tag to create a drawing area on a webpage.
	47.02 Use JavaScript to write text on a canvas.
	47.03 Use JavaScript to draw basic shapes (e.g., lines, circles, squares) on a canvas.
	47.04 Use JavaScript and AJAX to draw charts and graphs on a canvas.
48.0	Demonstrate an understanding of PHP scripting. The student will be able to:
	48.01 Define the purpose of PHP and describe its importance in web design.
	48.02 Discuss existing and emerging PHP versions.
	48.03 Discuss various configuration options for installing PHP on a server.
49.0	Design, write, debug, and incorporate a PHP client-side script into a webpage. The student will be able to:
	49.01 Write, analyze and explain PHP syntax.

CTE Standards and Benchmarks	
	49.02 Describe usage of various data types.
	49.03 Describe how the use of decision-making logic (e.g. and, or) is employed in a PHP program.
	49.04 Create and use variables, operators and expressions.
	49.05 Understand and incorporate PHP arrays (e.g., array basics, types, usage, methods, sorting).
	49.06 Understand and incorporate PHP objects (e.g., creation, access).
	49.07 Understand and incorporate PHP functions (e.g., pass a value, return value).
	49.08 Understand and incorporate PHP loops and conditions (e.g., loop basics, types, usage).
	49.09 Recognize, isolate, and correct common PHP errors (e.g., syntax, function errors, reserved word usage).
	49.10 Apply PHP best coding practices (i.e., properly documenting scripts, field naming conventions, writing understandable code).
	49.11 Troubleshoot and test incorporated script (i.e., functionality, browser usage, resolve known bugs).
50.0	Demonstrate an understanding of databases. The student will be able to:
	50.01 Define the purpose of a database and describe its importance in web design.
	50.02 Define the purpose of SQL.
	50.03 Discuss existing database management systems (e.g., MySQL, Oracle, SQL Server).
51.0	Incorporate a database into a webpage. The student will be able to:
	51.01 Create a database to store information for a website.
	51.02 Understand how to use basic SQL commands (e.g., select, insert, update, delete) to manipulate the information in a database.
	51.03 Execute SQL commands to manipulate the information in a database using a database management system.
	51.04 Execute SQL commands to manipulate the information in a database using PHP.

Florida Department of Education
Student Performance Standards

Course Title: **E-commerce & Marketing Essentials**
Course Number: **9001150**
Course Credit: **1**

Course Description:

This course provides instruction in the design, creation, marketing, and monitoring of e-commerce websites. Content also includes the associated security issues and methods.

CTE Standards and Benchmarks	
52.0	Demonstrate knowledge and skills necessary to setup a secure E-commerce site. The student will be able to:
52.01	Compare and contrast popular pre-built shopping cart software (e.g., PrestaShop, Zend Cart).
52.02	Compare and contrast hosting options available for use with shopping cart software (i.e., shared hosting or dedicated server).
52.03	Discuss shopping cart vulnerabilities and best-practice preventative measures.
52.04	Identify hardware and software necessary to install and setup pre-built shopping cart software.
52.05	Install and configure necessary software (database, server) to run pre-built shopping cart software.
52.06	Install and configure pre-built shopping cart software.
52.07	Verify database and server connectivity.
52.08	Test and troubleshoot setup/configuration issues.
53.0	Identify security issues associated with E-commerce and discuss methods to mitigate risks. The student will be able to:
53.01	Describe the differences between Transaction Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL).
53.02	Explain transaction security.
53.03	Identify security and payment processing issues involved in developing a site (e.g., SSL, Digital Certificates, SET Protocol, Cyber Cash).
53.04	Demonstrate understanding of https and .htaccess and their usage.
53.05	Explore methods to obtain an SSL certificate and secure transactions.
53.06	Compare and contrast the appropriateness of employing a merchant account or a payment gateway to handle online transactions.
53.07	Discuss the process, advantages, disadvantages, and costs associated with opening a merchant account.
53.08	Describe the process, advantages, disadvantages, and costs associated with using a payment gateway.

CTE Standards and Benchmarks	
54.0	Apply skills necessary to setup an E-commerce storefront. The student will be able to:
54.01	Setup and use an FTP (File Transfer Protocol) program to transfer files to a web server.
54.02	Add business specific information to site storefront (e.g., logos, product images, descriptions).
54.03	Setup back-end site administration functions and navigation.
54.04	Setup a schema for incorporating shipping, handling, and processing fees based on carrier, geographical zones, and weight/price range.
54.05	Experiment with various add-ons, themes, and modules available for customization.
54.06	Make simple modifications to a shopping cart to suit client needs (e.g., modify fields, add buttons).
54.07	Customize forms to accommodate client products and/or services.
54.08	Setup Search preferences and functionality for products and/or services.
54.09	Setup customer contact preferences and email notification functionality.
54.10	Apply Search Engine Optimization (SEO) techniques to shopping cart pages.
54.11	Test operation of shopping cart pages in multiple browsers.
54.12	Troubleshoot issues and errors related to browser display and functionality.
55.0	Employ techniques to enhance the value and profitability of an E-commerce website. The student will be able to:
55.01	Determine business goals for the E-commerce site.
55.02	Identify the various types of advertising options in E-commerce (e.g., links, banner ads, affiliate programs, pop-up windows, viral marketing, newsgroup postings).
55.03	Describe affiliate marketing and its implications for E-commerce websites.
55.04	Analyze popular affiliate programs/networks and available payment schemes.
55.05	Explain the differences, advantages, and disadvantages of CPM, PPC, and Pay per Sale/Lead.
55.06	Determine appropriate affiliate program for target audience.
55.07	Identify the method to join an affiliate program/network.
55.08	Identify considerations/requirements of selecting an affiliate program.
55.09	Determine appropriate number of affiliate programs necessary to suit client site.
55.10	Determine the terms and conditions of sale, including warranties, after-sales service, and privacy assurances.
55.11	Determine customer service options (e.g., e-mail, phone, fax).
55.12	Create a site map.

CTE Standards and Benchmarks	
	55.13 Create a Frequently Asked Questions (FAQ) page.
	55.14 Create a product/version comparison chart, where appropriate.
	55.15 Create feedback, review, survey, and recommendation pages.
56.0	Develop evaluation and performance monitoring metrics and target goals for an E-commerce website. The student will be able to:
	56.01 Research existing and emerging analytical, usability, SEO tools to improve customer satisfaction and site conversion rates.
	56.02 Describe web analytics tools and their features/functions.
	56.03 Use web analytics tools to determine optimum site keywords.
	56.04 Experiment with using advanced segments to view subsets of data (relating to purchasing habits, website usage, searches).
	56.05 Customize analytic reports using appropriate metrics (e.g., average per-visit value, bounce rates, time spent on page).
	56.06 Create more concise reports using advanced filters in web analytics tools.
	56.07 Use intelligence features of web analytics tools to discover patterns of usage and setup corresponding alerts.
	56.08 Research popular mobile analytics tools (e.g., Motally) and their features.
	56.09 Interpret analytic report data and optimize website accordingly, if appropriate.

Florida Department of Education
Student Performance Standards

Course Title: **Interactivity Essentials**
Course Number: **9001160**
Course Credit: **1**

Course Description:

This course provides instruction on technologies and techniques for enhancing the interactivity of websites from both site visitor and administration perspectives. Also covered are methods for PDF forms handling and content management.

CTE Standards and Benchmarks	
57.0	Demonstrate an understanding of Content Management Systems (CMS) and their implications for web development. The student will be able to:
57.01	Describe the fundamental operation of a CMS.
57.02	Describe the typical features of a content management system.
57.03	Compare and contrast popular CMS applications (e.g., WordPress, Joomla).
57.04	Describe how a content management system can be used to enhance website interactivity.
57.05	Demonstrate proficiency installing and configuring content management systems and extensions/modules.
58.0	Use CMS features, functions, and extensions/modules to create/enhance a website. The student will be able to:
58.01	Create a basic multipage website using a content management system.
58.02	Enhance a webpage by using a content management system to incorporate images, animations, or video segments.
58.03	Incorporate a blog feature into a website using a content management system.
58.04	Demonstrate proficiency using CMS built-in security for website, password and database backup.
58.05	Demonstrate proficiency using add-on modules, or plug-ins.
59.0	Evaluate the suitability for and system requirements for a content management system. The student will be able to:
59.01	Identify business goals and evaluate their suitability for a content management system.
59.02	Determine web hosting system requirements.
59.03	Create a schema for creating, deleting, and managing users and their permissions.
59.04	Discuss the value represented by templates in a content management system development environment.
60.0	Demonstrate an understanding of multimedia applications and their implications for web designers. The student will be able to:

CTE Standards and Benchmarks	
	60.01 Compare and contrast the leading multimedia development applications for website development (e.g., Adobe Flash, Microsoft Silverlight).
	60.02 Describe those circumstances whereby multimedia may be used to add interactivity to a website.
	60.03 Describe the limitations of multimedia development applications relative to website development viewed on various platforms (e.g., PCs, tablets, mobile devices).
61.0	Create and incorporate interactive website components. The student will be able to:
	61.01 Create buttons, menus, and other components that feature a static, hover, and rollover effect.
	61.02 Convert original artwork into an interactive component with associated script behavior.
	61.03 Adjust the component properties including opacity, filter, rotation, and action.
	61.04 Resize a multi-layer component to ensure uniform resizing of each layer.
	61.05 Create scrolling images, panels, and lists for incorporating into a web design.
	61.06 Create and incorporate animated banners, headers, and website introduction pages (e.g., Adobe Flash, Microsoft Silverlight).
62.0	PDF document usage considerations. The student will be able to:
	62.01 Discuss the advantages and disadvantages of using PDF documents in a website.
	62.02 Research and discuss PDF document usage best practices.
	62.03 Determine when it is appropriate to use PDF documents (e.g., brochure downloads, large reports, catalogs, interactive forms).
	62.04 Compare and contrast the functionality of software applications used to create and process PDFs.
	62.05 Research and describe search engine optimization considerations related to the use of PDF documents.
	62.06 Research and discuss security issues related to PDF document usage in a website (viruses, auto-open).
	62.07 Identify accessibility issues related to using PDF documents in a website.
63.0	Create, format, and manipulate PDF documents. The student will be able to:
	63.01 List & describe the methods available for creating PDF documents.
	63.02 Create a PDF using a variety of software applications, multiple files, and webpages.
	63.03 Demonstrate ability to format, modify and enhance a PDF document.
	63.04 Describe the differences in PDF standards for document prepress data interchange and long-term archiving.
	63.05 Embed images, text, audio, video, and Flash content into a PDF document.
	63.06 Create and modify automatically generated and manual bookmarks in a PDF document.
	63.07 Add clickable links to a PDF document.

CTE Standards and Benchmarks	
	63.08 Incorporate Find and Search methods to locate specific text in a PDF document.
	63.09 Describe the method used to search scanned documents (optical character recognition).
	63.10 Understand and correct color separation issues.
	63.11 Create and modify PDF documents using available tools to meet accessibility requirements (e.g., tags, reading order, forms, supplemental content for multimedia, text-to-speech).
	63.12 Export a PDF document in a different format.
64.0	Display, distribution, and print considerations for PDF documents. The student will be able to:
	64.01 Define file specifications use to generate smaller files for electronic distribution and on-screen display.
	64.02 Specify image downsampling and compression settings to generate a PDF file with a smaller file size.
	64.03 Identify and correct potential printing issues in a PDF document.
	64.04 Ensure a PDF document meets appropriate criteria for print or electronic distribution.
	64.05 Demonstrate ability to control flattening of a transparent PDF document and misregistration.
	64.06 Demonstrate color management techniques that affect on-screen display and printing.
	64.07 Discuss methods and tools used to review a PDF document (email, shared, tracking).
65.0	Create and manage PDF forms. The student will be able to:
	65.01 Create an interactive from using fields, form objects, and distribution methods.
	65.02 Distribute a form electronically and manage distributed forms.
	65.03 Demonstrate ability to redact content in a form to protect sensitive information.
	65.04 Preview, test, and modify an interactive form.
66.0	Incorporate PDF security in a PDF document. The student will be able to:
	66.01 Secure a PDF document using passwords, encryption, digital IDs and signatures.
	66.02 Creating Security Policies and Certificates for a PDF document.
	66.03 Enable usage rights for Adobe Readers.
67.0	Demonstrate proficiency using HTML5 features and functions. The student will be able to:
	67.01 Apply HTML5 APIs in webpages for interactivity (e.g., audio/video, drag & drop, drawing canvas).
	67.02 Apply HTML5 interactivity elements into webpages (i.e., <canvas>, <embed>, <audio>, <video>, <details> <input>).
	67.03 Utilize HTML5 fallback strategies to address browser support issues.

CTE Standards and Benchmarks	
67.04	Utilize HTML5 to define dynamic behaviors using JavaScript.
67.05	Use HTML5 specification to manipulate text and images.
67.06	Use HTML5 to create persistent data and single session storage (HTML 5 Local Offline Storage & Session Storage).
67.07	Use HTML5 for media event handling (audio, video, embed, image).
67.08	Use HTML5 event handling for window, mouse, and form events.
67.09	Use CSS3 to style HTML5 (e.g., transitions, typography enhancements).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Computer Systems & Information Technology (CSIT)**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9001200
CIP Number	0511090108
Grade Level	9-12
Program Length	6 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, SkillsUSA, FL-TSA
SOC Codes (all applicable)	15-1152 – Computer Network Support Specialists 15-1142 – Network and Computer Systems Administrators 15-1212 – Information Security Analysts
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of occupations in the information technology industry.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the information technology industry; technical and product skills, underlying principles of technology, planning, management, finance, labor issues, community issues and health, safety, and environmental issues.

The course content includes, but is not limited to, communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of six (6) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1 Options	8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
	9001210	CSIT Foundations	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G INFO TECH 7G CYBER TECH 7G ELECTRONIC @7 7G	1 credit	15-1151	3	CT
Course 2	9001220	CSIT System Essentials	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G INFO TECH 7G CYBER TECH 7G ELECTRONIC @7 7G	1 credit	15-1151	3	CT
Course 3	9001230	CSIT Network Systems Configuration		1 credit	15-1142	3	CT
Course 4	9001240	CSIT Network Systems Design & Administration		1 credit	15-1142	3	CT
Course 5	9001250	CSIT Cyber Security Essentials		1 credit	15-1212	3	CT
Course 6	9001260	CSIT Cyber Security - Physical		1 credit	15-1212	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Demonstrate proficiency with personal computer hardware.
11.0 Apply troubleshooting, repairing and maintenance techniques.
12.0 Understand operating systems and software.
13.0 Identify and construct a basic network.
14.0 Analyze and react to various security threats and vulnerabilities.
15.0 Explain the basic physical security elements of a network.
16.0 Demonstrate proficiency with operational procedure.
17.0 Demonstrate language arts knowledge and skills.
18.0 Demonstrate mathematics knowledge and skills.
19.0 Demonstrate proficiency with installing, configuring, and troubleshooting personal computer hardware.
20.0 Apply techniques to various operating systems.
21.0 Build, secure and troubleshoot medium to large.
22.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
23.0 Solve problems using critical thinking skills, creating and innovation.
24.0 Use information technology tools.
25.0 Describe the roles within teams, work units, departments, organizations, interorganizational systems, and the larger environment.
26.0 Describe the importance of professional ethics and legal responsibilities.
27.0 Describe the operation of data networks.
28.0 Verify connectivity between two end devices.
29.0 Configure a Layer 3 switch.
30.0 Program a router with basic configurations.
31.0 Explain how IPv6 address assignments are implemented in a business network.
32.0 Explain how data is moved across the network, from opening an application, to receiving data.

33.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
34.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
35.0 Explain the importance of employability skill and entrepreneurship skills.
36.0 Describe a switched network a small-to-medium-sized business.
37.0 Describe a routing environment.
38.0 Explore the concept of switches and security.
39.0 Configure and troubleshoot a Layer 3 environment.
40.0 Configure, troubleshoot and implement ACLs.
41.0 Demonstrate knowledge of how network services and protocols interact to provide network communication in order to securely implement and use common protocols.
42.0 Demonstrate an understanding of cybersecurity concepts and research.
43.0 Recognize attacks and apply appropriate solutions.
44.0 Recognize and be able to differentiate and explain the following access control models.
45.0 Comprehend and develop an understanding of protocol security and associated risks.
46.0 Recognize and understand remote access technologies.
47.0 Identify and administer security fixes as defined by the appropriate OSI layers.
48.0 Recognize and understand the administration of the following directory security concepts.
49.0 Identify wireless technologies, concepts and vulnerabilities.
50.0 Apply advanced principles of security techniques.
51.0 Define concepts of Key Management and Certificate Lifecycles.
52.0 Understand the application of the following concepts of physical security.
53.0 Understand security concerns for types of network topologies and media.
54.0 Implement the process of network system hardening within a computer network.
55.0 Describe the security implications of the following topics of disaster recovery options and utilities.
56.0 Demonstrate proficiency in applying the concepts and uses of the following types of policies and procedures.
57.0 Understand different types of privilege management.
58.0 Understand the concepts of cybersecurity guidelines.
59.0 Understand training of end users, executives and human resources in security vulnerabilities.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310)**.**

Florida Department of Education
Student Performance Standards

Course Title: **CSIT Foundations**
Course Number: **9001210**
Course Credit: **1**

CTE Standards and Benchmarks	
10.0	Demonstrate proficiency with personal computer hardware. The student will be able to:
10.01	Categorize storage devices and backup media, including tape and solid state drives.
10.02	Explain motherboard components, types and features.
10.03	Classify power supplies types and characteristics.
10.04	Explain the purpose and characteristics of CPUs and their features.
10.05	Explain cooling methods and devices.
10.06	Compare and contrast memory types, characteristics and their purpose.
10.07	Distinguish between the different display devices and their characteristics.
10.08	Install and configure peripherals and input devices.
10.09	Summarize the function and types of adapter cards with PCIe standard.
10.10	Install, configure and optimize laptop, tablets, netbooks and mobile phones components.
10.11	Install and configure printers and add network printers using static IP address.
10.12	Explain advantages of using PCIe adapter cards.
10.13	Configure tablets, netbooks and mobile phones.
10.14	Configure network printers using a static IP address.
11.0	Apply troubleshooting, repairing and maintenance techniques. The student will be able to:
11.01	Explain the troubleshooting theory.
11.02	Explain and interpret common hardware symptoms and their causes.
11.03	Explain and interpret common operating system symptoms and their causes.
11.04	Determine the troubleshooting methods and tools for printers.
11.05	Explain and interpret common laptop issues and determine the appropriate basic troubleshooting method.
11.06	Integrate common preventative maintenance techniques.

CTE Standards and Benchmarks	
	11.07 Explain and interpret common software symptoms and their causes.
12.0	Understand operating systems and software. The student will be able to:
	12.01 Compare and contrast the different Windows Operating Systems from Windows 7 up and their features.
	12.02 Explain the difference in features of the various Operating Systems.
	12.03 Explain the process and steps to install and configure the Operating Systems.
	12.04 Explain the basics of boot sequences, methods and startup utilities.
13.0	Identify and construct a basic network. The student will be able to:
	13.01 Summarize the basics of networking fundamentals, including technologies and devices.
	13.02 Summarize the basics of networking fundamentals, including technologies and protocols.
	13.03 Construct and categorize network cables and connectors and their implementations.
	13.04 Compare and contrast the different network types.
14.0	Analyze and react to various security threats and vulnerabilities. The student will be able to:
	14.01 Explain the basic principles of security concepts and technologies (physical, software, social engineering).
	14.02 Explain and define security features.
15.0	Explain the basic physical security elements of a network. The student will be able to:
	15.01 Explain the basic software security elements of a network, including firewalls, IDS and IPS.
	15.02 Explain how the human element plays a major role in network security, including social engineering.
16.0	Demonstrate proficiency with operational procedure. The student will be able to:
	16.01 Outline the purpose of appropriate safety and environmental procedures.
	16.02 Given a problem, demonstrate communication and technical skills to escalate the problem for a solution.
	16.03 Explain chain of custody for various scenarios.
17.0	Demonstrate language arts knowledge and skills. The student will be able to:
	17.01 Locate, comprehend and evaluate key elements of oral and written information.
	17.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
	17.03 Present information formally and informally for specific purposes and audiences.
18.0	Demonstrate mathematics knowledge and skills. The student will be able to:

CTE Standards and Benchmarks
18.01 Demonstrate knowledge of arithmetic operations.
18.02 Analyze and apply data and measurements to solve problems and interpret documents.
18.03 Construct charts/tables/graphs using functions and data.

Florida Department of Education
Student Performance Standards

Course Title: **CSIT System Essentials**
Course Number: **9001220**
Course Credit: **1**

CTE Standards and Benchmarks	
19.0	Demonstrate proficiency with installing, configuring, and troubleshooting personal computer hardware. The student will be able to:
19.01	Install, configure and maintain personal computer components.
19.02	Detect problems, troubleshoot and repair/replace personal computer components.
19.03	Install, configure, detect problems, troubleshoot and repair/replace laptop components.
19.04	Explain and demonstrate the use of computer tools.
20.0	Apply techniques to various operating systems. The student will be able to:
20.01	Select the appropriate commands and options to troubleshoot and resolve problems.
20.02	Differentiate between Operating System file structures.
20.03	Given a scenario, select and use system utilities/tools and evaluate the results.
20.04	Evaluate and resolve common issues.
21.0	Build, secure and troubleshoot medium to large. The student will be able to:
21.01	Troubleshoot client-side connectivity issues using appropriate tools.
21.02	Install and configure a small office home office (SOHO) network.
21.03	Given a scenario, prevent, troubleshoot and remove viruses and malware.
21.04	Implement security and troubleshoot common issues.
22.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
22.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
22.02	Locate, organize and reference written information from various sources.
22.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
22.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.
22.05	Apply active listening skills to obtain and clarify information.
22.06	Develop and interpret tables and charts to support written and oral communications.

CTE Standards and Benchmarks	
	22.07 Exhibit public relations skills that aid in achieving customer satisfaction.
23.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	23.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	23.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	23.03 Identify and document workplace performance goals and monitor progress toward those goals.
	23.04 Conduct technical research to gather information necessary for decision-making.
24.0	Use information technology tools. The student will be able to:
	24.01 Use personal information management (PIM) applications to increase workplace efficiency.
	24.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	24.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	24.04 Employ collaborative/groupware applications to facilitate group work.
25.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	25.01 Describe the nature and types of business organizations.
	25.02 Explain the effect of key organizational systems on performance and quality.
	25.03 List and describe quality control systems and/or practices common to the workplace.
	25.04 Explain the impact of the global economy on business organizations.
26.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	26.01 Evaluate and justify decisions based on ethical reasoning.
	26.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	26.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	26.04 Interpret and explain written organizational policies and procedures.
	26.05 Explain various types of software licensing.

Florida Department of Education
Student Performance Standards

Course Title: **CSIT Network Systems Configuration**
Course Number: **9001230**
Course Credit: **1**

CTE Standards and Benchmarks	
27.0	Describe the operation of data networks. The student will be able to:
27.01	Explain how multiple networks are used in everyday life.
27.02	Explain the topologies and devices used in a small-to-medium-sized business network.
27.03	Explain the basic characteristics of a network that supports communication in a small-to-medium-sized business.
27.04	Explain trends in networking that will affect the use of networks in small-to-medium-sized businesses.
27.05	Explain the purpose of the IOS.
27.06	Explain how to access and navigate the IOS to configure network devices.
27.07	Describe the command structure of the IOS software.
27.08	Configure hostnames on an IOS device using the CLI.
27.09	Use IOS commands to limit access to device configurations.
27.10	Use IOS commands to save the running configuration.
27.11	Explain how devices communicate across network media.
27.12	Configure a host device with an IP address.
28.0	Verify connectivity between two end devices. The student will be able to:
28.01	Explain how rules are used to facilitate communication.
28.02	Explain the role of protocols and standards organizations in facilitating interoperability in network communications.
28.03	Explain how devices on a LAN access resources in a small to medium-sized business network.
28.04	Identify device connectivity options.
28.05	Describe the purpose and functions of the physical layer in the network.
28.06	Describe basic principles of the physical layer standards.
28.07	Identify the basic characteristics of network cables and connector types.
28.08	Build and terminate UTP cable used in Ethernet networks.

CTE Standards and Benchmarks	
	28.09 Describe, build and terminate fiber-optic cabling and its main advantages over other media.
	28.10 Describe wireless media.
	28.11 Select the appropriate media for a given requirement and connect devices.
	28.12 Describe the operation of the Ethernet sub layers.
	28.13 Identify the major fields of the Ethernet frame.
	28.14 Describe the purpose and characteristics of the Ethernet MAC address.
	28.15 Describe the purpose of ARP.
	28.16 Explain how ARP requests impact network and host performance.
	28.17 Explain basic switching concepts.
	28.18 Compare fixed configuration and modular switches.
29.0	Configure a Layer 3 switch. The student will be able to:
	29.01 Explain how network layer protocols and services support communications across data networks.
	29.02 Explain how routers enable end-to-end connectivity in a small to medium-sized business network.
	29.03 Determine the appropriate device to route traffic in a small to medium-sized business network.
30.0	Program a router with basic configurations. The student will be able to:
	30.01 Describe the purpose of the transport layer in managing the transportation of data in end-to-end communication.
	30.02 Describe characteristics of the TCP and UDP protocols, including port numbers and their uses.
	30.03 Explain how TCP session establishment and termination processes facilitate reliable communication.
	30.04 Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery.
	30.05 Explain the UDP client processes to establish communication with a server.
	30.06 Determine whether high-reliability TCP transmissions, or non-guaranteed UDP transmissions, are best suited for common applications.
	30.07 Describe the structure of addresses.
	30.08 Describe the purpose of the subnet mask.
	30.09 Compare the characteristics and uses of the unicast, broadcast, and multicast IPv4 addresses.
	30.10 Compare the use of public address space and private address space.
	30.11 Explain the need for IPv6 addressing.

CTE Standards and Benchmarks	
	30.12 Describe the representation of an IPv6 address.
	30.13 Describe types of IPv6 network addresses.
	30.14 Configure global unicast addresses.
	30.15 Describe multicast addresses.
	30.16 Describe the role of ICMP in an IP network (include IP addresses).
	30.17 Use ping and trace route utilities to test network connectivity.
	30.18 Explain why routing is necessary for hosts on different networks to communicate.
	30.19 Describe IP as a communication protocol used to identify a single device on a network.
	30.20 Given a network and a subnet mask, calculate the number of host addresses available.
	30.21 Calculate the necessary subnet mask in order to accommodate the requirements of a network.
	30.22 Describe the benefits of variable length subnet masking (VLSM).
31.0	Explain how IPv6 address assignments are implemented in a business network. The student will be able to:
	31.01 Explain how the functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications.
	31.02 Describe how common application layer protocols interact with end user applications.
	31.03 Describe, at a high level, common application layer protocols that provide Internet services to end-users, including web services and email.
	31.04 Describe application layer protocols that provide IP addressing services.
	31.05 Describe the features and operation of well-known application layer protocols that allow for file sharing services.
32.0	Explain how data is moved across the network, from opening an application, to receiving data. The student will be able to:
	32.01 Identify the devices and protocols used in a small network.
	32.02 Explain how a small network serves as the basis of larger networks.
	32.03 Describe the need for basic security measures on network devices.
	32.04 Identify security vulnerabilities and general mitigation techniques.
	32.05 Configure network devices with device hardening features to mitigate security threats.
	32.06 Use the output of ping and trace commands to establish relative network performance.
33.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:

CTE Standards and Benchmarks	
	33.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	33.02 Explain emergency procedures to follow in response to workplace accidents.
	33.03 Create a disaster and/or emergency response plan.
34.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	34.01 Employ leadership skills to accomplish organizational goals and objectives.
	34.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	34.03 Conduct and participate in meetings to accomplish work tasks.
	34.04 Employ mentoring skills to inspire and teach others.
35.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	35.01 Identify and demonstrate positive work behaviors needed to be employable.
	35.02 Develop personal career plan that includes goals, objectives, and strategies.
	35.03 Examine licensing, certification, and industry credentialing requirements.
	35.04 Maintain a career portfolio to document knowledge, skills, and experience.
	35.05 Evaluate and compare employment opportunities that match career goals.
	35.06 Identify and exhibit traits for retaining employment.
	35.07 Identify opportunities and research requirements for career advancement.
	35.08 Research the benefits of ongoing professional development.
	35.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **CSIT Network Systems Design & Administration**
Course Number: **9001240**
Course Credit: **1**

CTE Standards and Benchmarks	
36.0	Describe a switched network in a small-to-medium-sized business. The student will be able to:
36.01	Describe convergence of data, voice, and video in the context of switched networks.
36.02	Setup and configure a switched environment.
36.03	Troubleshoot and diagnose a switched environment.
37.0	Describe a routing environment. The student will be able to:
37.01	Configure a router to route between multiple directly connected networks.
37.02	Describe the primary functions and features of a router.
37.03	Explain how routers use information in data packets to make forwarding decisions in a small-to medium-sized business network.
37.04	Describe configure and troubleshoot VLAN routing environment.
38.0	Explore the concept of switches and security. The student will be able to:
38.01	Explain the advantages and disadvantages of static routing.
38.02	Configure switch ports and security.
38.03	Describe security best practices in a switch environment.
38.04	Explain, configure and troubleshoot VLAN in a switch network.
39.0	Configure and troubleshoot a Layer 3 environment. The student will be able to:
39.01	Explain the advantages and disadvantages of Layer 3 routing.
39.02	Define, compare and configure the different categories of routing protocols.
40.0	Configure, troubleshoot and implement ACLs. The student will be able to:
40.01	Explain, configure and modify ACLs.
40.02	Apply ACLs to filter traffic.
41.0	Demonstrate knowledge of how network services and protocols interact to provide network communication in order to securely implement and use common protocols. The student will be able to:

CTE Standards and Benchmarks
41.01 Describe and configure protocols (i.e., SMTP, TCP-IP, MAC, DNS, FTP and DHCP).
41.02 Identify commonly used default network ports.
41.03 Troubleshoot configure protocols within a switched network.

Florida Department of Education
Student Performance Standards

Course Title: CSIT Cyber Security Essentials
Course Number: 9001250
Course Credit: 1

CTE Standards and Benchmarks	
42.0	Demonstrate an understanding of cybersecurity concepts and research. The student will be able to:
42.01	Describe the history of cybersecurity, including the evolution of a hacker culture.
42.02	Discuss the trends and national initiatives related to cybersecurity.
42.03	Distinguish between information assurance and cybersecurity.
42.04	Describe the concepts of confidentiality as it relates to user and data impact.
42.05	Explain authentication and the concept of non-repudiation.
43.0	Recognize attacks and apply appropriate solutions. The student will be able to:
43.01	Recognize and define network susceptibilities and attacks. (i.e., DOS/DDOS (Denial of Service/Distributed Denial of Service)).
43.02	Recognize and define Password Guessing (e.g., Brute Force, Dictionary).
43.03	Recognize and define Software Exploitation.
43.04	Define email vulnerabilities apply appropriate security measures.
44.0	Recognize and be able to differentiate and explain the following access control models. The student will be able to:
44.01	Recognize and define MAC (Mandatory Access Control).
44.02	Recognize and define DAC (Discretionary Access Control).
44.03	Recognize and define RBAC (Role Based Access Control).
45.0	Comprehend and develop an understanding of protocol security and associated risks. The student will be able to:
45.01	Identify non-essential services and protocols running on hosts and network devices and know what actions to take to reduce the risks of those services and protocols.
45.02	Understand the concept of and know how reduce the risks of social engineering.
45.03	Understand the concept and significance of auditing, logging and system scanning.
45.04	Identify and be able to differentiate different cryptographic standards and protocols.
46.0	Recognize and understand remote access technologies. The student will be able to:

CTE Standards and Benchmarks	
	46.01 Recognize and define 802.1x.
	46.02 Recognize and define RADIUS (Remote Authentication Dial-In User Service).
	46.03 Recognize and define TACACS (Terminal Access Controller Access Control System) and TACTCs+.
	46.04 Recognize and define L2TP/PPTP (Layer Two Tunneling Protocol/Point to Point Tunneling Protocol).
	46.05 Recognize and define SSH (Secure Shell).
	46.06 Recognize and define IPSEC (Internet Protocol Security).
47.0	Identify and administer security fixes as defined by the appropriate OSI layers. The student will be able to:
	47.01 Recognize and define SSL/TLS (Secure Sockets Layer/Transport Layer Security).
	47.02 Recognize and define LDAP (Lightweight Directory Access Protocol).
48.0	Recognize and understand the administration of the following directory security concepts. The student will be able to:
	48.01 Identify the different types of application layer protocol (POP3, SMTP, DNS and FTP).
	48.02 Recognize and define File Sharing.
	48.03 Recognize and define Vulnerabilities (i.e., packet sniffing, naming conventions).
49.0	Identify wireless technologies, concepts and vulnerabilities. The student will be able to:
	49.01 Recognize and define WTLS (Wireless Transport Layer Security).
	49.02 Differentiate Wi-Fi threats.
	49.03 Apply encryption protocols for wireless networks.
50.0	Apply advanced principles of security techniques. The student will be able to:
	50.01 Compare and contrast Host and Network Based security techniques.
	50.02 Be able to identify and explain cryptographic algorithms.
	50.03 Understand how cryptography and digital signatures address the following security concepts.
	50.04 Identify authentication tools (e.g., PKI Public Key Infrastructure, Certificates, Renocation and Trust Models).
51.0	Define concepts of Key Management and Certificate Lifecycles. The student will be able to:
	51.01 Identify various security CA requirements.
	51.02 Understand Hardware versus software key storage, Private key storage, Escrow, Expiration, Revocation, Renewal, Destruction, Key Usage, Multiple Key Pairs.
	51.03 Create key management and procedures.

Florida Department of Education
Student Performance Standards

Course Title: CSIT Cyber Security – Physical
Course Number: 9001260
Course Credit: 1

CTE Standards and Benchmarks	
52.0	Understand the application of the following concepts of physical security. The student will be able to:
52.01	Define Access Control (e.g., physical barriers, biometrics).
52.02	Define Social Engineering.
52.03	Defines issues related to Environment (e.g., wireless cells, location, shielding, fire suppression).
53.0	Understand security concerns for types of network topologies and media. The student will be able to:
53.01	Recognize, define, and configure network hardware, appliances and handheld devices.
53.02	Define, and configure Network Monitoring/Diagnostics tools.
53.03	Understand the security concerns for the following types of media.
54.0	Implement the process of network system hardening within a computer network. The student will be able to:
54.01	Install and configure Updates (Firmware & Software).
54.02	Install and configure Operating System and ACL's.
54.03	Enable and Disable Services and Protocols.
54.04	Setup and configure a server hardening within a computer network.
55.0	Describe the security implications of the following topics of disaster recovery options and utilities. The student will be able to:
55.01	Define and use Backups Secure Recovery, Recovery Plan and Alternative sites. (on-site versus off-site storage).
55.02	Recognize and define Backup Utilities and High Availability/Fault Tolerance.
56.0	Demonstrate proficiency in applying the concepts and uses of the following types of policies and procedures. The student will be able to:
56.01	Demonstrate proficiency and understanding of Security Policy Acceptable Use, Privacy, Separation of Duties, Need to Know, Password Management and SLA's.
56.02	Demonstrate proficiency and understanding of Disposal/Destruction.
56.03	Demonstrate proficiency and understanding of HR policies related to passwords, privileges, and Code of Ethics in hiring and termination situations.
56.04	Demonstrate proficiency and understanding of Incident Response Policy.

CTE Standards and Benchmarks	
57.0	Understand different types of privilege management. The student will be able to:
57.01	Identify User/Group/Role Management and Single Sign-on.
57.02	Define Centralized vs. Decentralized.
57.03	Understand the importance of Auditing (Privilege, Usage, Escalation).
57.04	Define MAC/DAC/RBAC (Mandatory Access Control/Discretionary Access Control/Role Based Access Control).
58.0	Understand the concepts of cybersecurity guidelines. The student will be able to:
58.01	Demonstrate an understanding of the concepts of forensics guidelines.
58.02	Explain Systems Architecture and documentation.
58.03	Explain Change Logs and Inventories.
58.04	Explain Classification/Notification, Schema, Retention/Storage, and Destruction.
58.05	Understand and be able to explain the following concepts of risk identification.
58.06	Explain Asset Identification and Risk Assessment.
58.07	Define threat identification and vulnerabilities.
59.0	Understand training of end users, executives and human resources in security vulnerabilities. The student will be able to:
59.01	Identify effective training strategies and education resources.
59.02	Create appropriate methods of security Information awareness strategies.
59.03	Understand importance of On-line Resources.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

No new students may be enrolled in this program starting 2026-27. The last year to report any enrollment is 2028-29. This program was replaced by Applied Cybersecurity 9001600 (0511100317).

Program Title: **Applied Cybersecurity**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9001300
CIP Number	0511100315
Grade Level	9-12
Program Length	5 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1212 – Information Security Analysts
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and cybersecurity-related careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of cybersecurity.

The content includes but is not limited to foundational knowledge and skills in computer and network security, security vulnerabilities, attack mechanisms and techniques, intrusion detection and prevention, cryptographic systems, system hardening, risk identification, incidence response, penetration testing, key management, access control, and recovery. Specialized courses focus on database security, planning and analysis, software, and web security.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of five (5) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations **OR**	DBF Teacher Certifications	1 credit	15-1212	2	CT
9001310	IT Fundamentals **AND**	BUS ED 1 @2 COMPU SCI 6 CYBER TECH 7G INFO TECH 7G	1 credit	15-1212	2	CT
9001320	Computer and Network Security Fundamentals		1 credit	15-1212	3	CT
9001330	Cybersecurity Essentials		1 credit	15-1212	3	CT
9001340	Operational Cybersecurity		1 credit	15-1212	3	CT
And one or more of the following courses:						
9001350	Cybersecurity Planning & Analysis		1 credit	15-1212	3	CT
9001360	Database Security		1 credit	15-1212	3	CT
9001370	Software & Application Security		1 credit	15-1212	3	CT
9001380	Web Security		1 credit	15-1212	3	CT
9001390	Applied Cybersecurity Applications		1 credit	15-1212	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Develop an awareness of microcomputers.
03.0 Demonstrate an understanding of networks.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance communication skills.
07.0 Use database applications to store and organize data.
08.0 Use electronic mail to enhance communication skills.
09.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
10.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
11.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
12.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
13.0 Demonstrate an understanding of basic html by creating a simple web page.
14.0 Demonstrate comprehension and communication skills.
15.0 Use social media to enhance online communication and develop an awareness of a digital footprint.

OR

IT Fundamentals

16.0 Demonstrate knowledge, skill, and application of computer systems.
17.0 Demonstrate knowledge of different operating systems.
18.0 Develop a familiarity with the information technology industry.
19.0 Develop an awareness of microprocessors and digital computers.
20.0 Develop an awareness of programming languages.
21.0 Develop an awareness of emerging technologies.
22.0 Demonstrate an understanding of the Open Systems Interconnection (OSI) models.
23.0 Demonstrate an understanding of the TCP/IP model.
24.0 Identify computer components and their functions.
25.0 Demonstrate proficiency using the Internet to locate information.
26.0 Demonstrate an understanding of Internet safety and ethics.

27.0 Demonstrate proficiency using common software applications.
28.0 Perform email activities.
29.0 Demonstrate proficiency in using presentation software and equipment.
30.0 Perform decision-making activities in a multimedia environment.
31.0 Demonstrate language arts knowledge and skills.
32.0 Demonstrate mathematics knowledge and skills.
33.0 Demonstrate science knowledge and skills.

AND

Computer and Network Security Fundamentals
34.0 Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications.
35.0 Describe the national agencies and supporting initiatives involved in cybersecurity.
36.0 Discuss the underlying concepts of terms used in cybersecurity.
37.0 Demonstrate an understanding of basic computer components, their functions, and their operation.
38.0 Demonstrate knowledge of different operating systems.
39.0 Demonstrate an understanding of the Open Systems Interface (OSI) model.
40.0 Demonstrate an understanding of the TCP/IP model.
41.0 Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model.
42.0 Demonstrate proficiency using computer networks.
43.0 Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections.
44.0 Demonstrate an understanding of basic security concepts.
45.0 Demonstrate an understanding of legal and ethical issues in cybersecurity.
46.0 Demonstrate an understanding of virtualization technology.
47.0 Recognize and understand the administration of remote access technologies.
48.0 Understand the application of concepts of physical security.
49.0 Securely configure and maintain the following types of devices.
50.0 Understand the societal and security challenges of emerging technologies.
51.0 Recognize and be able to differentiate and explain access control models.
52.0 Understand the security concerns for media.
53.0 Explain the following security topologies as they relate to cybersecurity.
54.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
55.0 Solve problems using critical thinking skills, creativity and innovation.
56.0 Use information technology tools.
57.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
58.0 Describe the importance of professional ethics and legal responsibilities.

Cybersecurity Essentials
59.0 Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges.
60.0 Demonstrate an understanding of common information and computer system security vulnerabilities.

61.0 Demonstrate an understanding of common cyberattack mechanisms, their consequences, and motivation for their use.
62.0 Be able to identify and explain the following different kinds of cryptographic algorithms.
63.0 Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity.
64.0 Understand how cryptography and digital signatures address the following security concepts.
65.0 Understand and be able to explain the following concepts of PKI (Public Key Infrastructure).
66.0 Demonstrate an understanding of certificates and their role in cybersecurity.
67.0 Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation.
68.0 Demonstrate an understanding of Intrusion Detection Systems (IDS).
69.0 Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
70.0 Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
71.0 Demonstrate an understanding of IDS applications.
72.0 Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques.
73.0 Demonstrate an understanding of firewalls and other means of intrusion prevention.
74.0 Demonstrate an understanding of vulnerabilities unique to virtual computing environments.
75.0 Demonstrate an understanding of social engineering and its implications to cybersecurity.
76.0 Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability.
77.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
78.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
79.0 Explain the importance of employability skill and entrepreneurship skills.

Operational Cybersecurity
80.0 Demonstrate an understanding of how to configure host systems to guard against cyber intrusion.
81.0 Demonstrate an understanding of authentication methods and strategies.
82.0 Demonstrate an understanding of methods and strategies for controlling access to computer networks.
83.0 Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured.
84.0 Demonstrate an understanding of the processes involved in hardening a computer system or network.
85.0 Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations.
86.0 Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization.
87.0 Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes.
88.0 Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase.

AND ONE OR MORE OF THE FOLLOWING COURSES:

Cybersecurity Planning & Analysis
89.0 Demonstrate proficiency in cybersecurity risk mitigation planning.
90.0 Demonstrate proficiency in establishing a risk management framework.
91.0 Demonstrate proficiency in creating a corporate security policy.
92.0 Demonstrate proficiency in addressing process risks.
93.0 Demonstrate proficiency in addressing physical security risks.

94.0 Demonstrate proficiency in cybersecurity contingency planning.
95.0 Demonstrate proficiency in cybersecurity disaster recovery planning.
96.0 Demonstrate proficiency in cybersecurity business continuity planning.
97.0 Demonstrate proficiency in the essential elements of forensic analysis.

Database Security
98.0 Demonstrate an understanding of database design, structure, and operation.
99.0 Demonstrate a fundamental understanding of Structured Query Language (SQL).
100.0 Demonstrate an understanding of database security policies.
101.0 Demonstrate an understanding of database access control, functions, methods, and verification.
102.0 Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures.
103.0 Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery.

Software & Application Security
104.0 Demonstrate an understanding of software design, structure, and operation.
105.0 Demonstrate a fundamental understanding of common software attack vectors.
106.0 Demonstrate an understanding input syntax validation.
107.0 Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code.
108.0 Demonstrate an understanding of the role of environment variables in the operation of software applications.
109.0 Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks.

Web Security
110.0 Demonstrate an understanding of the primary security services used in Internet and intranet environments.
111.0 Demonstrate a fundamental understanding of the SSL protocol stack and its elements.
112.0 Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms.
113.0 Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates.
114.0 Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network.
115.0 Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains.

Applied Cybersecurity Applications
116.0 Complete a safety skills inventory.
117.0 Demonstrate acceptable project values.
118.0 Demonstrate the ability to detect and resolve system vulnerabilities.
119.0 Plan, organize, and carry out a penetration testing plan.
120.0 Demonstrate proficiency in conducting forensic analysis.
121.0 Successfully work as a member of a team.
122.0 Manage time according to a plan.
123.0 Keep acceptable records of progress problems and solutions.
124.0 Manage resources.
125.0 Use tools, materials, and processes in an appropriate and safe manner.

126.0 Research content related to the project and document the results.
127.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
128.0 Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

OR

Florida Department of Education
Student Performance Standards

Course Title: **IT Fundamentals**
Course Number: **9001310**
Course Credit: **1**

Course Description:

This course introduces students to the essential concepts, components, terminology, and knowledge about computers, computer systems, peripherals, and networks.

CTE Standards and Benchmarks	
16.0	Demonstrate knowledge, skill, and application of computer systems. The student will be able to:
16.01	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
16.02	Describe the types of communications and networking systems used in workplace environments.
16.03	Locate and use software application reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals.
16.04	Troubleshoot problems with computer hardware peripherals.
16.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
16.06	Demonstrate proficiency in using the basic features of GUI browsers.
16.07	Configure computer systems to protect against various low-level attacks.
17.0	Demonstrate knowledge of different operating systems. The student will be able to:
17.01	Identify the most common computer operating systems.
17.02	Describe and use industry accepted file naming conventions; particularly in NTFS, ext4, FAT, and ReFS file systems.
17.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
17.04	Demonstrate a working knowledge of standard file formats.
17.05	Compare and contrast various operating systems (e.g., Android iOS, Windows, Mac, and Linux).
17.06	Differentiate between different operating systems and applications.
17.07	Compare and contrast open source and proprietary software.
17.08	Explain how system utilities are used to maintain computer performance.
17.09	Evaluate criteria for selecting an operating system.

CTE Standards and Benchmarks	
	17.10 Configure various operating systems from their default settings to low, medium, and high security level settings.
18.0	Develop a familiarity with the information technology industry. The student will be able to:
	18.01 Explain how information technology impacts the operation and management of business and society.
	18.02 Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile).
	18.03 Describe how digital technologies (social media) are changing both work and personal lifestyles.
	18.04 Demonstrate an understanding of configuring social media used for business to meet various business requirements.
	18.05 Demonstrate an awareness of Cloud based infrastructure including SaaS (Software as a Service) and their impact on the IT industry.
19.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
	19.01 Explain software hierarchy and its impact on microprocessors as it relates to the limitation and/or increase in security.
	19.02 Explain the need for, and use of, peripherals and how they can compromise security.
	19.03 Demonstrate proficiency installing and using plug-and-play peripherals and explain their associated security risks.
	19.04 Identify the basic concepts of computer maintenance and upgrades and their relevance as it relates to security.
20.0	Develop an awareness of programming languages. The student will be able to:
	20.01 Explain the need for and use of compilers.
	20.02 Identify the three types of programming design approaches (e.g., top-down, structured, object-oriented).
	20.03 Compare the various types or classes of programming languages (e.g., compiled, interpretive).
	20.04 Differentiate among source code, machine code, interpreters, and compilers.
	20.05 Characterize the major categories of programming languages and how they are used.
	20.06 Create a model flowchart for a computer program using software applications like RAPTOR or MS VISIO.
	20.07 Describe the stages in the software development life cycle and explain how to successfully implement them.
	20.08 Compare security and vulnerabilities of various programming languages.
21.0	Develop an awareness of emerging technologies. The student will be able to:
	21.01 Compare and contrast emerging technologies and describe how they impact the security of business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, vehicles, home networks, peer-to-peer, IoT, embedded systems, AI).
	21.02 Adhere to published best practices for protecting personal identifiable information when using the Internet.
	21.03 Identify trends related to the secure use of information technology in people's personal and professional lives.
	21.04 Characterize how the rapid pace of change in information technology impacts our society's ability to keep the appropriate level of

CTE Standards and Benchmarks	
	security.
22.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) models. The student will be able to:
	22.01 Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.
	22.02 Describe the purpose of the OSI model and each of its layers.
	22.03 Explain specific functions belonging to each OSI model layer.
	22.04 Understand how two network nodes communicate through the OSI model.
	22.05 Discuss the structure and purpose of data packets and frames.
	22.06 Describe the two types of addressing covered by the OSI model.
23.0	Demonstrate an understanding of the TCP/IP model. The student will be able to:
	23.01 Explain the interrelations of the four layers of the TCP/IP model as it relates to hardware and software.
	23.02 Describe the purpose of the TCP/IP model and each of its layers.
	23.03 Explain specific functions belonging to each TCP/IP model layer.
	23.04 Understand how two network nodes communicate through the TCP/IP model.
	23.05 Describe the two types of addressing covered by the TCP/IP model.
24.0	Identify computer components and their functions. The student will be able to:
	24.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	24.02 Use common computer and programming terminology.
25.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
	25.01 Identify and describe web terminology.
	25.02 Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto) and their associated secure protocols (e.g. https, ftps, ssh).
	25.03 Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	25.04 Demonstrate proficiency using search engines, including Boolean search strategies.
	25.05 Demonstrate proficiency using various secure web tools (e.g., downloading of files, transfer of files, SSH, PDF).
	25.06 Compare and contrast the roles of web servers and web browsers.
	25.07 Compare and contrast MS Web Servers and Linux Web Servers.
26.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:

CTE Standards and Benchmarks	
	26.01 Describe cyber-bullying and its impact on perpetrators and victims.
	26.02 Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.
	26.03 Describe risks associated with sexting, related legal issues, social engineering aspects, prevention methods, and reporting of offenses.
	26.04 Describe the risks associated with online gaming and ways to reduce these risks.
	26.05 Describe the intellectual property rights, ethics and legalities of downloading music or videos from the Internet.
	26.06 Describe various risks associated with social networking sites and ways to reduce these risks.
	26.07 Describe the risks associated with various conferencing programs and ways to reduce these risks.
	26.08 Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.
27.0	Demonstrate proficiency using common software applications. The student will be able to:
	27.01 Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, email, presentation, database, scheduling, financial management, Java applet, music).
	27.02 Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, email, presentation, database, scheduling, financial management, Java applet, music).
28.0	Perform email activities. The student will be able to:
	28.01 Describe email capabilities and functions.
	28.02 Identify components of an email message.
	28.03 Identify the components of an email address.
	28.04 Identify when to use different email options.
	28.05 Attach a file to an email message.
	28.06 Forward an email message.
	28.07 Use an address book if an address book is available via the school's Outlook server for the student to use.
	28.08 Reply to an email message.
	28.09 Use the Internet to perform email activities.
	28.10 Identify the appropriate use of email and demonstrate related email etiquette.
	28.11 Recognize a fraudulent email and deal with it appropriately.
	28.12 Identify common problems associated with widespread use of email.
	28.13 Create folders to organize email.

CTE Standards and Benchmarks	
29.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
29.01	Produce a presentation that includes music, animation, and digital photography and present it using appropriate technology.
29.02	Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
29.03	Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g., project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers).
29.04	Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
29.05	Create a self-running presentation with synchronized audio, convert presentation slides (e.g., PowerPoint) into streaming ASF files for use on the web.
30.0	Perform decision-making activities in a multimedia environment. The student will be able to:
30.01	Determine work priorities, the audience, project budgets, project specifications, and the production schedule.
30.02	Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks.
30.03	Present and defend design projects.
31.0	Demonstrate language arts knowledge and skills. The student will be able to:
31.01	Locate, comprehend and evaluate key elements of oral and written information.
31.02	Draft, revise, and edit written business technology documents using correct grammar, punctuation and vocabulary (e.g., Business Continuity and Disaster Recovery plan, Incident Response plan, IT reports and procedures manuals).
31.03	Present information formally and informally to instruct others on Computer Security Awareness and Victim Prevention.
32.0	Demonstrate mathematics knowledge and skills. The student will be able to:
32.01	Demonstrate knowledge of arithmetic operations.
32.02	Construct charts/tables/graphs using functions and data and relate it to IT risk and business continuity.
32.03	Demonstrate an understanding of binary numbers and ASCII characters.
33.0	Demonstrate science knowledge and skills. The student will be able to:
33.01	Discuss the role of creativity in constructing scientific questions, methods and explanations.
33.02	Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.

Florida Department of Education
Student Performance Standards

Course Title: **Computer and Network Security Fundamentals**
Course Number: **9001320**
Course Credit: **1**

Course Description:

This course introduces students to cybersecurity and provides them with essential computer and networking knowledge and skills, particularly those related to cybersecurity.

CTE Standards and Benchmarks	
34.0	Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications. The student will be able to:
34.01	Define cybersecurity.
34.02	Describe how information security evolved into cybersecurity and the impact of the Internet on the pace and nature of the evolution.
34.03	Describe the individual elements that comprise the CIA triad (i.e., Confidentiality, Integrity, Availability).
34.04	Define and explain the various types of hackers and the role each plays in cybersecurity.
34.05	Describe various methodologies used by hackers and the basis for their employment.
34.06	Describe the individual elements of the AAA model (Authentication, Authorization and Accounting).
35.0	Describe the national agencies and supporting initiatives involved in cybersecurity. The student will be able to:
35.01	Describe the role of the National Security Agency.
35.02	Describe current trends in cyberattacks and strategies for combating them.
35.03	Describe the legal implications of computer hacking and other forms of cyberattacks.
35.04	Understand the importance of the weekly bulletins distributed by the United States Computer Emergency Readiness Team (US-CERT).
35.05	Determine if any software or hardware on a given network has vulnerabilities outlined in the most recent US-CERT bulletin.
36.0	Discuss the underlying concepts of terms used in cybersecurity. The student will be able to:
36.01	Differentiate between cybersecurity and information assurance.
36.02	Define confidentiality and give examples of security breaches.
36.03	Define integrity and give examples of security breaches.
36.04	Define authenticity and give examples of security breaches.

CTE Standards and Benchmarks	
	36.05 Define accountability (non-repudiation) and give examples of security breaches.
37.0	Demonstrate an understanding of basic computer components, their functions, and their operation. The student will be able to:
	37.01 Describe the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	37.02 Demonstrate and understanding of common computer and programming terminology.
	37.03 Explain the physical and logical architecture of a microcomputer system.
	37.04 Describe the file types used in the operation of a computer.
	37.05 Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management).
38.0	Demonstrate knowledge of different operating systems. The student will be able to:
	38.01 Compare operating system file naming conventions.
	38.02 Describe the common elements that comprise the architecture of an operating system (e.g., kernel, file manager, memory manager, device manager, network manager).
	38.03 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	38.04 Demonstrate a working knowledge of standard file formats.
	38.05 Describe the purpose of various operating systems (e.g., Windows, Mac, iOS, Android and Linux).
	38.06 Describe the difference between client and network operating systems.
	38.07 Differentiate between different operating systems and applications and Macros.
	38.08 Explain the basics of boot sequences, methods and startup utilities.
	38.09 Compare and contrast open source and proprietary software.
	38.10 Describe common system utilities used in performing computer maintenance.
39.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) model. The student will be able to:
	39.01 Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.
	39.02 Describe the purpose of the OSI model and each of its layers.
	39.03 Explain specific functions belonging to each OSI model layer.
	39.04 Understand how two network nodes communicate through the OSI model.
	39.05 Discuss the structure and purpose of data packets and frames.
	39.06 Describe the two types of addressing covered by the OSI model.
40.0	Demonstrate an understanding of the TCP/IP model. The student will be able to:

CTE Standards and Benchmarks	
	40.01 Explain the interrelations of the four layers of the TCP/IP model as it relates to hardware and software.
	40.02 Describe the purpose of the TCP/IP model and each of its layers.
	40.03 Explain specific functions belonging to each TCP/IP model layer.
	40.04 Understand how two network nodes communicate through the TCP/IP model.
	40.05 Describe the two types of addressing covered by the TCP/IP model.
41.0	Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model. The student will be able to:
	41.01 Describe the services and protocols used in the OSI Application Layer (i.e., DHCP, DNS, FTP, HTTP, SMTP, Telnet, IMAP).
	41.02 Describe the services and protocols used in the OSI Transport Layer (i.e., TCP, TLS/SSL, UDP).
	41.03 Describe the services and protocols used in the OSI Network Layer (i.e., IP, ICMP, IGMP, IPsec).
	41.04 Describe the services and protocols used in the OSI Data Link Layer (i.e., ARP, OSPF, L2TP, PPP).
42.0	Demonstrate proficiency using computer networks. The student will be able to:
	42.01 Define networking and describe the purpose of a network.
	42.02 Describe the conceptual background of digital networks and cloud computing including terminology and basics.
	42.03 Describe various types of networks and the advantages and disadvantages of each (e.g., peer to peer, client/server, server/thin client, ROI).
	42.04 Describe the use, advantages, and disadvantages of various network media (e.g. coaxial, twisted pair, fiber optics).
	42.05 Describe the function of various network devices (e.g., managed switch, switched hub or switch, router, bridge, gateway, access points, modem).
	42.06 Describe how network devices are identified (i.e., IP addressing).
	42.07 Explain the protocols commonly used in a network environment.
	42.08 Differentiate between public and private IP addresses.
	42.09 Describe the common ports and corresponding protocols used in a network.
	42.10 Describe the difference between the Internet and intranet.
	42.11 Compare and contrast IPv4 and IPv6.
	42.12 Compare and contrast the different methods for network connectivity (e.g., broadband, wireless, Bluetooth, cellular).
	42.13 Discuss the differences between Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Virtual Local Area Network (VLAN), and Virtual Private Network (VPN).
43.0	Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections.

CTE Standards and Benchmarks	
	43.01 Describe the various types of cloud computing (IaaS, PaaS, SaaS) and modes of delivery (Public, Private, Community, Hybrid).
	43.02 Describe practices that aid in protecting the Hybrid cloud model.
	43.03 Describe the challenges and solutions associated with securing embedded devices.
44.0	Demonstrate an understanding of basic security concepts. The student will be able to:
	44.01 Distinguish between vulnerability and a threat.
	44.02 Discuss the different types of attacks (e.g., active, passive).
	44.03 Define security policy and explain its role in cybersecurity.
	44.04 Describe the basic methods of authentication (e.g., password, biometrics, smart cards. two-factor authentication, multifactor authentication).
	44.05 Describe the various forms of encryption methodologies (e.g., symmetric, asymmetric, block cipher, stream cipher).
	44.06 Describe hash functions and their role in authentication.
	44.07 Describe various method of access control used in computer security (e.g., policies, groups, Access Control List (ACL)).
	44.08 Understand the concept of malware (i.e., ransomware, worms, viruses, adware) and how attackers use it to steal sensitive or confidential information.
45.0	Demonstrate an understanding of legal and ethical issues in cybersecurity. The student will be able to:
	45.01 Define cybercrime and discuss the challenges facing law enforcement.
	45.02 Identify the key legislative acts that impact cybersecurity.
	45.03 Describe the Federal criminal code related to computers and give examples of cybercrimes and penalties, particularly those involving inappropriate access.
	45.04 Discuss the concept of digital forensics and its place in cybercrime investigations and incident response.
	45.05 Distinguish among the Intellectual Property Rights of trademark, patent, and copyright.
	45.06 Explain digital rights management and the implications of the Digital Millennium Copyright Act (DMCA).
	45.07 Describe the implications of various social media on the safeguarding of personal or sensitive information.
	45.08 Describe various safeguards that can be employed to help ensure that sensitive or confidential information is not inadvertently divulged or obtained.
46.0	Demonstrate an understanding of virtualization technology. The student will be able to:
	46.01 Define virtual computing.
	46.02 Explain the benefits of virtual computing.
	46.03 Differentiate between guest and host operating systems.

CTE Standards and Benchmarks	
	46.04 Install desktop virtualization software.
	46.05 Describe the role of the hypervisor.
	46.06 Create and upgrade a virtual machine.
	46.07 Optimize the performance of a virtual machine.
	46.08 Preserve the state of a virtual machine.
	46.09 Clone, move and share virtual machines.
	46.10 Use basic (static) and dynamic virtual disks and disk drives.
	46.11 Configure a virtual network.
	46.12 Connect devices to a virtual machine.
	46.13 Enable security settings on a virtual machine.
47.0	Recognize and understand the administration of remote access technologies. The student will be able to:
	47.01 Configure 802.1x authentication for a given scenario.
	47.02 Connect clients to a VPN.
	47.03 Understand Authentication, Authorization and Accounting (AAA) management.
	47.04 Differentiate between TACACS+ (Terminal Access Controller Access Control System) and RADIUS.
	47.05 Differentiate between Layer 2 Tunneling Protocol (L2TP) and Point-to-Point Tunneling Protocol (PPTP) protocols as they apply to VPN options.
	47.06 Implement the use of SSH (Secure Shell).
	47.07 Implement the use of IPsec (Internet Protocol Security).
	47.08 Identify vulnerabilities associated with authentication.
	47.09 Understand ways to implement VoIP technologies.
	47.10 Demonstrate the use and purpose of Kerberos.
48.0	Understand the application of concepts of physical security. The student will be able to:
	48.01 Configure access controls including biometric devices, keypads and security tokens.
	48.02 Recognize social engineering attempts.
	48.03 Evaluate environmental controls (e.g., EMI shielding, temperature, humidity and fire suppression).
	48.04 Develop a method of training users to recognize, report, and avoid social engineering attempts.

CTE Standards and Benchmarks	
	48.05 Identify components of physical security, including mantraps, motion detection, alarm systems, locks, video surveillance, and fences/barricades.
	48.06 Install a camera for a video surveillance system.
	48.07 Configure an alarm system including a keypad and motion detector.
	48.08 Recognize vulnerabilities associated with physical security.
	48.09 Explain how a mantrap is used as a counter measure against tailgating.
49.0	Securely configure and maintain the following types of devices. The student will be able to:
	49.01 Configure and maintain software and hardware firewalls.
	49.02 Configure and secure routers.
	49.03 Apply security settings to switches.
	49.04 Configure and secure wireless devices.
	49.05 Secure a LAN connected to a DSL/cable modem.
	49.06 Configure a RAS (Remote Access Server) for remote connectivity.
	49.07 Securely deploy a PBX (Private Branch Exchange).
	49.08 Explain the benefits of implementing a VPN (Virtual Private Network).
	49.09 Deploy IDS (intrusion detection system) and IPS (intrusion prevention systems).
	49.10 Analyze the performance, efficiency and security of the network based on network monitoring and diagnostic software.
	49.11 Employ techniques used to lock down workstations.
	49.12 Configure and secure servers for a given scenario.
	49.13 Understand and assess the security of mobile devices including but not limited to those using the Android, iOS and Windows platforms.
50.0	Understand the societal and security challenges of emerging technologies. The student will be able to:
	50.01 Explain the security implications of the Internet of Things (IoT) (i.e., understand the efforts to address authentication and updates to IoT devices).
	50.02 Explain societal and security challenges associated with robotics.
	50.03 Explain security challenges associated with serverless computing.
	50.04 Explain societal and security challenges associated with the implementation of 5G.
	50.05 Describe and explain the security challenges of Autonomous vehicles (i.e., the significance of vehicular cybersecurity and its relation to: computer vision, artificial intelligence, machine learning and deep learning).

CTE Standards and Benchmarks	
51.0	Recognize and be able to differentiate and explain access control models. The student will be able to:
51.01	Understand access control as it applies to MAC (Mandatory Access Control).
51.02	Understand access control as it applies to DAC (Discretionary Access Control).
51.03	Understand access control as it applies to RBAC (Role Based Access Control).
52.0	Understand the security concerns for media. The student will be able to:
52.01	Understand and identify security concerns with the use of Coaxial Cable.
52.02	The student should be able to identify and understand security concerns for UTP/STP (Unshielded Twisted Pair / Shielded Twisted Pair).
52.03	Identify and understand security concerns fiber optic cable.
52.04	Identify security concerns associated with removable media.
52.05	Address pitfalls associated with tape backups.
52.06	Apply drive encryption to hard drives.
52.07	Secure flash drives.
52.08	Smartcards and secure USB memory.
53.0	Explain the following security topologies as they relate to cybersecurity. The student will be able to:
53.01	Determine Security Zones.
53.02	Point out vulnerabilities on a DMZ (Demilitarized Zone).
53.03	Explain the security benefits of using an intranet.
53.04	Explain the security benefits of using an extranet.
53.05	Secure a VLAN (Virtual Local Area Network).
53.06	Describe the security benefits associated with NAT (Network Address Translation).
53.07	Justify the implementation of tunneling, for security purpose.
54.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
54.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
54.02	Locate, organize and reference written information from various sources.
54.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
54.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.

CTE Standards and Benchmarks	
	54.05 Apply active listening skills to obtain and clarify information.
	54.06 Develop and interpret tables and charts to support written and oral communications.
	54.07 Exhibit public relations skills that aid in achieving customer satisfaction.
55.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	55.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	55.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	55.03 Identify and document workplace performance goals and monitor progress toward those goals.
	55.04 Conduct technical research to gather information necessary for decision-making.
56.0	Use information technology tools. The student will be able to:
	56.01 Use personal information management (PIM) applications to increase workplace efficiency.
	56.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	56.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	56.04 Employ collaborative/groupware applications to facilitate group work.
57.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	57.01 Describe the nature and types of business organizations.
	57.02 Explain the effect of key organizational systems on performance and quality.
	57.03 List and describe quality control systems and/or practices common to the workplace.
	57.04 Explain the impact of the global economy on business organizations.
58.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	58.01 Evaluate and justify decisions based on ethical reasoning.
	58.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	58.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	58.04 Interpret and explain written organizational policies and procedures.
	58.05 Display proficiency in using team-oriented collaboration and video teleconferencing software (e.g. Teams, Zoom).

Florida Department of Education
Student Performance Standards

Course Title: **Cybersecurity Essentials**
Course Number: **9001330**
Course Credit: **1**

Course Description:

This course provides students with insight into the many variations of vulnerabilities, attack mechanisms, intrusion detection systems, and some methods to mitigate cybersecurity risks, including certificate services and cryptographic systems.

CTE Standards and Benchmarks	
59.0	Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges. The student will be able to:
59.01	Explain the various elements that make up the security taxonomy used by the U.S. Computer Emergency Readiness Team (CERT).
59.02	Describe the challenges associated with achieving and maintaining computer security.
59.03	Discuss the range of potential consequences of various forms of security breaches.
59.04	Describe various defense mechanisms, techniques, and methodologies (e.g., antivirus, anti-malware, protocol analyzers and scans, analyzing email headers, patch management).
59.05	Compare and contrast mechanisms employed in passive and active cyberattacks.
59.06	Describe vulnerabilities associated with each element of the CIA Triad.
59.07	Explain the differences between hardware, software, data, and network assets susceptible to cyber-attack.
59.08	Describe the tools and technologies used in cybersecurity.
59.09	Define intrusion detection and discuss its role in cybersecurity (e.g., HIDS and NIDS).
59.10	Explain what is meant by the term countermeasures (e.g., NIPS and HIPS).
59.11	Describe the role recovery plays in cybersecurity (e.g., Business Continuity Plan).
60.0	Demonstrate an understanding of common information and computer system security vulnerabilities. The student will be able to:
60.01	Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, and organizational).
60.02	Describe the ways in which various social networks are cybersecurity targets.
60.03	Describe footprinting and explain how it is used to reveal system vulnerabilities.
60.04	Explain why default values and technical controls are points of vulnerability and describe the hardening efforts being taken by government and industry.

CTE Standards and Benchmarks	
	60.05 Describe the process of port scanning and explain why it is so prevalent in cybersecurity.
	60.06 Describe what is meant by password strength and explain its relationship to vulnerability.
	60.07 Distinguish between a weak and a strong password.
	60.08 Describe some of the ways in which intruders can cover their tracks.
	60.09 Describe the circumstances under which a computer system is vulnerable to a denial of service attack.
61.0	Demonstrate an understanding of common cyberattack mechanisms, their consequences, and motivation for their use. The student will be able to:
	61.01 Describe spoofing as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.02 Describe the introduction of malware or spyware as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.03 Describe the use of grayware as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.04 Describe the use of computer viruses or worms as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.05 Describe Logic Bombs as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.06 Describe botnet and rootkit as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.07 Describe the introduction of a Trojan horse as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.08 Describe DNS poisoning as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.09 Describe buffer overflow as an attack mechanism and discuss its consequences and common motivating factors for its use.
	61.10 Understand the risk associated with a zero-day exploit.
	61.11 Understand risks associated with P2P networking including the Gnutella protocol and Torrents.
	61.12 Describe the use of ransomware as an attack mechanism and discuss its consequences and common motivating factors for its use.
62.0	Be able to identify and explain the following different kinds of cryptographic algorithms. The student will be able to:
	62.01 Demonstrate the use and purpose of hashing functions.
	62.02 Demonstrate the use and purpose of symmetric keys.
	62.03 Demonstrate the use and purpose of asymmetric keys.
63.0	Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity. The student will be able to:
	63.01 Network steganographic methods (e.g., WLAN).
	63.02 Digital steganographic methods (e.g., image encryption, audio, mimic functions, video, packet manipulation).

CTE Standards and Benchmarks	
	63.03 Understand how steganographic methods are used in malware.
64.0	Understand how cryptography and digital signatures address the following security concepts. The student will be able to:
	64.01 Provide examples of confidentiality.
	64.02 Provide examples of integrity.
	64.03 Provide examples of authentication.
	64.04 Provide examples of non-repudiation.
	64.05 Provide examples of access control.
65.0	Understand and be able to explain the following concepts of PKI (Public Key Infrastructure). The student will be able to:
	65.01 Provide examples of certificates (e.g., policies, practice statements).
	65.02 Provide examples of revocation.
	65.03 Provide examples of trust models.
66.0	Demonstrate an understanding of certificates and their role in cybersecurity. The student will be able to:
	66.01 Describe the role of a Certificate Authority (CA).
	66.02 Describe Registration Authority (RA) and its relevance to security certificates.
	66.03 Compare and contrast SSL/TSL X.509-compliant certificates with PGP-compliant certificates.
	66.04 Describe the events that make up the lifecycle of a certificate.
	66.05 Describe how root certificate distribution works.
	66.06 Describe the role of a Certificate Revocation List (CRL).
	66.07 Describe the role of the Online Certificate Status Protocol (OCSP).
67.0	Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation. The student will be able to:
	67.01 Define intrusion.
	67.02 Describe the classes of intruders (i.e., masquerader, misfeasor, clandestine user).
	67.03 Describe what is meant by a hacker and discuss their role in cybersecurity.
	67.04 Compare and contrast the “black hat”, “white hat”, “blue hat”, and “grey hat” hacker cultures (i.e., computer criminal versus computer security expert).
	67.05 Describe various techniques used by hackers to achieve intrusion.
	67.06 Describe the difference between an inside and an outside attack.

CTE Standards and Benchmarks	
68.0	Demonstrate an understanding of Intrusion Detection Systems (IDS). The student will be able to:
68.01	Describe the three logical components of IDS (i.e., sensors, analyzers, user interface).
68.02	Explain how user behavior relates to the detection of an intruder.
68.03	Describe the essential requirements for any IDS.
69.0	Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
69.01	Describe anomaly detection, specifically threshold and profile-based approaches.
69.02	Describe the types of audit records employed in intrusion detection (i.e., native, detection-specific).
69.03	Describe signature detection, specifically rule-based anomaly and penetration identification approaches.
70.0	Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
70.01	Describe the primary approach for intrusion detection in a network.
70.02	Compare and contrast inline and passive sensors.
70.03	Discuss typical placement of sensors in a network-based IDS environment and explain the rationale for each.
71.0	Demonstrate an understanding of IDS applications. The student will be able to:
71.01	Describe the operation, typical activities, and outputs of an intrusion detection system.
71.02	Describe some of the limitations of intrusion detection systems.
71.03	Differentiate between an intrusion detection system (passive) and an intrusion prevention (reactive) system.
71.04	Compare and contrast several of the intrusion detection systems available on the current market.
72.0	Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques. The student will be able to:
72.01	Describe the process of monitoring/detecting port scanning attacks and associated patterns.
72.02	Explain how the monitoring and analysis of network traffic can be used to detect intrusion.
72.03	Utilize network monitoring and analysis tools to detect intrusion and anomalies.
73.0	Demonstrate an understanding of firewalls and other means of intrusion prevention. The student will be able to:
73.01	Describe the purpose and limitations of firewalls.
73.02	Describe the four types of firewalls (i.e., packet filtering, stateful inspection, application-level gateway, circuit-level gateway).
73.03	Describe the use of honeypots as an intrusion prevention technique.
73.04	Explain how security policies are used to prevent intruders.

CTE Standards and Benchmarks	
	73.05 Explain how Access Control Lists (ACLs) are used to prevent intrusion.
74.0	Demonstrate an understanding of vulnerabilities unique to virtual computing environments. The student will be able to:
	74.01 Describe the limitations of traffic monitoring within virtual networks.
	74.02 Discuss the primary vulnerability of virtual operating systems.
	74.03 Describe the “hypervisor” and explain its role in securing a virtual environment.
75.0	Demonstrate an understanding of social engineering and its implications to cybersecurity. The student will be able to:
	75.01 Define social engineering and describe its role in cybersecurity.
	75.02 Discuss common mechanisms that constitute social engineering (e.g., phishing, baiting, quid pro quo, pretexting).
	75.03 Describe the variety of attacks targeting the human element.
	75.04 Describe countermeasures that can be used to counter social engineering attacks.
76.0	Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability. The student will be able to:
	76.01 Discuss the three over-arching security design principles (i.e., only necessary, simple, ease of use).
	76.02 Describe the principle of least privilege as it relates to computer security.
	76.03 Describe the principle of separation of duties as it relates to computer security.
	76.04 Describe the principle of defense in depth as it relates to computer security.
	76.05 Describe the principle of fail secure or fail safe and false positive or false negative as it relates to computer security.
	76.06 Describe the principle of economy of mechanism as it relates to computer security.
	76.07 Describe the principle of complete mediation as it relates to computer security.
	76.08 Describe the principle of open design as it relates to computer security.
	76.09 Describe the principle of least common mechanism as it relates to computer security.
	76.10 Describe the principle of psychological acceptability as it relates to computer security.
	76.11 Describe the principle of leveraging existing components as it relates to computer security.
	76.12 Describe the principle of weakest link as it relates to computer security.
	76.13 Describe the principle of single point of failure as it relates to computer security.
77.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	77.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.

CTE Standards and Benchmarks	
	77.02 Explain emergency procedures to follow in response to workplace accidents.
	77.03 Create a disaster and/or emergency response plan.
78.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	78.01 Employ leadership skills to accomplish organizational goals and objectives.
	78.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	78.03 Conduct and participate in meetings to accomplish work tasks.
	78.04 Employ mentoring skills to inspire and teach others.
79.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	79.01 Identify and demonstrate positive work behaviors needed to be employable.
	79.02 Develop personal career plan that includes goals, objectives, and strategies.
	79.03 Examine licensing, certification, and industry credentialing requirements.
	79.04 Maintain a career portfolio to document knowledge, skills, and experience.
	79.05 Evaluate and compare employment opportunities that match career goals.
	79.06 Identify and exhibit traits for retaining employment.
	79.07 Identify opportunities and research requirements for career advancement.
	79.08 Research the benefits of ongoing professional development.
	79.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Operational Cybersecurity**
Course Number: **9001340**
Course Credit: **1**

Course Description:

This course provides students with insight into the many ways in which computer systems can be secured, countermeasures implemented, and risk assessment performed.

CTE Standards and Benchmarks	
80.0	Demonstrate an understanding of how to configure host systems to guard against cyber intrusion. The student will be able to:
80.01	Describe the security features and options available for configuring network routers to prevent intrusion.
80.02	Describe the various types of firewalls (i.e., packet filtering, stateful, application-level gateway, circuit-level gateway) and how each can be used to prevent intrusion.
80.03	Explain the configuration and operation of a Demilitarized Zone (DMZ) host, including the key services contained within the zone.
80.04	Describe the role of security zones, content filters, subnets, and trusted zones in configuring a network infrastructure.
81.0	Demonstrate an understanding of authentication methods and strategies. The student will be able to:
81.01	Describe the strengths, vulnerabilities, and countermeasures related to the use of passwords for authentication.
81.02	Describe ways in which passwords are compromised and techniques/models for strengthening.
81.03	Explain token authentication methods (e.g., memory cards, smart cards) and limitations.
81.04	Discuss the use of biometrics (i.e., facial recognition, fingerprint, hand geometry, retinal pattern, iris, signature, voice) as an authentication strategy, including its advantages, limitations, vulnerabilities, and countermeasures.
81.05	Describe the challenges associated with remote user authentication, including unique vulnerabilities and corresponding and effective countermeasures.
82.0	Demonstrate an understanding of methods and strategies for controlling access to computer networks. The student will be able to:
82.01	Compare and contrast the three primary categories of access control (i.e., discretionary, mandatory, role-based).
82.02	Describe the underlying principles of authorization as an access control mechanism applicable to individuals, system services, subjects, and objects.
82.03	Discuss the key features of an access control system (i.e., reliable input, granularity, least privilege, separation of duty, open/close policies, conflict resolution, administration).
82.04	Describe the three elements of access control (i.e., subject, object, rights).

CTE Standards and Benchmarks	
	82.05 Describe access rights (i.e., read, write, execute, delete, create, search) and their use in establishing individual and group access control policies.
	82.06 Compare and contrast the use, operation, and limitations of Access Control Matrix (ACM), Access Control Lists (ACLs), and Capability Tickets in a network environment.
	82.07 Describe the UNIX file access control schema.
	82.08 Explain the relationship between security policies and access control.
	82.09 Describe the use and conceptual operation of formal security policy models (e.g., Bell-La Padula (BLP), Chinese Wall Model (CWM), Harrison Ruzzo Ullman (HRU)).
	82.10 Describe the use, strengths, and vulnerabilities of group policies in access control and strategies for ensuring safety.
	82.11 Describe the key entities, relationships, and functions that comprise Role-Based Access Control (RBAC), including privilege management considerations.
83.0	Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured. The student will be able to:
	83.01 Describe the operation of Dynamic Host Configuration Protocol (DHCP), its vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
	83.02 Describe the operation of the Domain Name System (DNS) service, its role in a network environment, its vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
	83.03 Describe the operation of the Simple Mail Transport Protocol (SMTP), its role in a network environment, its vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
	83.04 Describe the operation of the File Transfer Protocol (FTP) and Telnet, their role in a network environment, their vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
84.0	Demonstrate an understanding of the processes involved in hardening a computer system or network. The student will be able to:
	84.01 Describe hardening and some of the general approaches for securing a computer network.
	84.02 Describe and apply the process by which a web server is hardened against their typical cyberattacks.
	84.03 Describe and apply the process by which a mail server is hardened against their typical cyberattacks.
	84.04 Describe and apply the process by which a FTP server is hardened against their typical cyberattacks.
	84.05 Describe and apply the process by which a file/print server is hardened against their typical cyberattacks.
	84.06 Describe and apply the process by which data repositories are hardened against their typical cyberattacks.
	84.07 Describe and apply the process by which Directory Services is hardened against their typical cyberattacks.
	84.08 Describe and apply the process by which various network appliances are hardened against their typical cyberattacks.
85.0	Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations. The student will be able to:

CTE Standards and Benchmarks	
	85.01 Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.
	85.02 Describe key escrow, its role in key management, its advantages, and its risks.
	85.03 Differentiate between key backup and key escrow.
	85.04 Explain the role of a key's expiration date, its implications on the key's validity, and its relationship to deactivation.
	85.05 Describe the circumstances under which a key might be revoked, who has authority to revoke a key, and how revocation is communicated.
	85.06 Compare and contrast key suspension and key revocation.
	85.07 Describe ways in which key recovery might be achieved, who is authorized to recover keys, and associated vulnerabilities to attack.
	85.08 Compare and contrast key renewal and key replacement, who is authorized to initiate renewal or replacement, and associated vulnerabilities to attack.
	85.09 Describe the circumstances under which a key might be destroyed, the considerations prior to destruction, and associated vulnerabilities to compromise or attack.
86.0	Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization. The student will be able to:
	86.01 Describe the process of asset identification relative to risk assessment and the considerations or criteria used in identifying assets requiring protection and understand how to leverage a configuration management database (CMDB) for asset management.
	86.02 Describe the process of threat identification, including identifying the types of threats, asset vulnerabilities, and threat sources.
	86.03 Describe the process of risk assessment, including determination of attack probability, attack consequences, and assignment of risk priorities.
	86.04 Evaluate an existing security posture and identify gaps and vulnerabilities in security.
	86.05 Describe the role of governance, risk, and compliance in achieving a more secure organization.
	86.06 Describe the concepts of Key Performance Indicators and Risk Measurement. (e.g., annualized loss expectancy (ALE), annual rate of occurrence (ARO), single loss expectancy (SLE), Exposure Factor (EF).)
	86.07 Analyze and apply data and measurements to solve business problems and relate it to IT risk and business continuity.
87.0	Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes. The student will be able to:
	87.01 Describe the types of penetration tests (i.e., human, physical, wireless, data networks, telecommunications), the goals of each type, the metrics tested, and the value of their results.
	87.02 Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
	87.03 Define attack vector and explain its relationship and importance to penetration testing.
	87.04 Describe common testing methodologies and standards used in penetration testing.

CTE Standards and Benchmarks	
87.05	Describe the salient points, structure, detail, and documentation typically addressed in reporting and debriefing the results of penetration testing.
87.06	Detect malicious and abnormal activities through logs, intrusion detection systems, and other utilities and appliances.
87.07	Reproduce methods that intruders use to gain unauthorized access to a network system for purposes of compromising information assets.
87.08	Deploy proprietary and/or open source tools to test known technical vulnerabilities in networked systems.
87.09	Determine which vulnerabilities are exploitable and estimate the risk and impact of potential exploitations.
87.10	Recommend appropriate mitigation procedures against discovered vulnerabilities and security gaps.
87.11	Model the ethics of a licensed Penetration Tester or Computer Security Specialist.
88.0	Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase. The student will be able to:
88.01	Describe the activities that make up the Preparation Phase of the Incident Response Life Cycle (e.g., identification of useful tools and resources, setting up a war room, securing communications, creating a governance team, identifying key stakeholders for response activities).
88.02	Describe the activities that make up the Detection and Analysis Phase of the Incident Response Life Cycle, including identification of indication sources, analysis of resulting signs of an intrusion event, documentation, and notification of the incident.
88.03	Describe the factors to consider when prioritizing an incident.
88.04	Describe the activities that make up the Containment, Eradication, and Recovery Phase of the Incident Response Life Cycle, including selecting a containment strategy, collecting and preserving evidence for forensic analysis, identifying the attacker, re-securing the system, and system restoration.
88.05	Describe the activities that make up the Post Incident Activity Phase of the Incident Response Life Cycle, including identification of lessons learned and evidence retention.

Florida Department of Education
Student Performance Standards

Course Title: **Cybersecurity Planning & Analysis**
Course Number: **9001350**
Course Credit: **1**

Course Description:

This course focuses on the mitigation planning, disaster recovery, business continuity planning, and forensic analysis associated with securing computer environments. Many of the standards covered in this framework are based on or aligned with guidelines published by the Computer Security Division of the National Institute of Standards and Technology (NIST).

CTE Standards and Benchmarks	
89.0	Demonstrate proficiency in cybersecurity risk mitigation planning. The student will be able to:
89.01	Describe the major activities and security controls that are implemented as part of a sound risk management program.
89.02	Discuss the rationale for executive sponsorship and delineated management responsibilities in successfully implementing a risk management program.
90.0	Demonstrate proficiency in establishing a risk management framework. The student will be able to:
90.01	Describe the importance of creating a system definition for use in assessing vulnerabilities and risks.
90.02	Describe the major elements of a system definition.
90.03	Differentiate among critical assets, cyber assets, and critical cyber assets.
90.04	Explain why cyber assets are classified as public, restricted, confidential, or private and why this plays a role in creating a risk management framework.
90.05	Compare and contrast the classes of cyber assets (i.e., public, restricted, confidential, private) and give examples of each.
90.06	Create a system definition that identifies all cyber assets, their class, and their risk category (e.g., critical).
90.07	Describe an Electronic Security Perimeter (ESP) and discuss its role in formulating a risk management framework.
90.08	Describe the process and goals of a vulnerability assessment of ESP access points.
90.09	Define risk level and explain the variabilities of its components.
90.10	Describe ways in which system vulnerability may be ranked according to impact (e.g., safety, outage, privacy, monetary).
90.11	Describe some of the security controls (e.g., access control, training, audit, configuration, maintenance) that come into play when determining the appropriate risk mitigation strategy.
90.12	Compare and contrast a top-down and a bottoms-up analysis approach for identifying and mitigating risks.

CTE Standards and Benchmarks	
	90.13 Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
	90.14 Create a risk management framework.
91.0	Demonstrate proficiency in creating a corporate security policy. The student will be able to:
	91.01 Describe the best practices and security controls that typify a sound corporate security policy.
	91.02 Discuss the elements of a corporate security policy, including policy management, personnel and training, critical asset management, ESP, physical security, incident reporting and response, disaster recovery and business continuity plans.
	91.03 Describe the need for specific implementation and enforcement processes as part of a corporate security policy.
	91.04 Explain the controls required for addressing personnel risks in a corporate security policy (e.g., training, hiring due diligence, enforcement of “least privilege,” access revocation).
92.0	Demonstrate proficiency in addressing process risks. The student will be able to:
	92.01 Describe the best practices and security controls typically implemented for assessing and mitigating operational risks, including.
	• Conduct periodic posture risk assessments.
	• Enforce access control, monitoring, and logging.
	• Perform disposal/redeployment of assets.
	• Enforce change control and configuration management.
	• Conduct vulnerability assessments.
	• Control, monitor, and log all access to assets.
	• Configuration and maintenance.
	• Ensure incident-handling processes.
	• Provide for contingency planning.
	92.02 Create an organized mitigation table that identifies operational or process risks, the potential impact of the risk, and specific actions required to mitigate the risk.
93.0	Demonstrate proficiency in addressing physical security risks. The student will be able to:
	93.01 Describe the best practices and security controls that ensure good physical security of critical infrastructure and assets.
	93.02 Discuss the resulting potential for compromise once physical security is breached.
	93.03 Create an organized mitigation table that identifies physical security risks, the potential impact of the risk, and specific actions required to mitigate the risk.
94.0	Demonstrate proficiency in cybersecurity contingency planning. The student will be able to:
	94.01 Define resiliency and its relationship to contingency planning.

CTE Standards and Benchmarks	
	94.02 Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
	94.03 Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, Appendices).
	94.04 Describe the contingency planning process and the rationale for each step in the process.
	94.05 Explain the three step process for conducting a business impact analysis (i.e., determine recovery criticality, identify resource requirements, identify recovery priorities).
	94.06 Compare and contrast Maximum Tolerable Downtime (MTD), Recovery Time Objective (RTO), and Recovery Point Objective (RPO).
	94.07 Discuss the criteria typically used to activate the contingency plan.
	94.08 Discuss the role of backup and recovery considerations in contingency planning.
	94.09 Create a contingency plan that includes roles and responsibilities, a business impact analysis with contingency strategies/solutions, outage assessment, resource recovery priorities, backup and recovery strategies, and testing/training considerations.
95.0	Demonstrate proficiency in cybersecurity disaster recovery planning. The student will be able to:
	95.01 Describe the purpose and scope of a cybersecurity disaster recovery plan.
	95.02 Describe various recovery strategies according to their appropriateness.
	95.03 Explain the key considerations when formalizing a disaster recovery plan.
	95.04 Discuss the role of data collection relative to disaster recovery.
	95.05 Identify the types, purposes, and role of documentation during disaster recovery.
	95.06 Discuss the role of testing in a disaster recovery plan.
96.0	Demonstrate proficiency in cybersecurity business continuity planning. The student will be able to:
	96.01 Describe the purpose and scope of a cybersecurity business continuity plan.
	96.02 Explain the concept of fault tolerance and discuss its role in business continuity planning.
	96.03 Identify and use various utilities employed for the purpose of business continuity.
	96.04 Describe the role of backups for ensuring business continuity.
97.0	Demonstrate proficiency in the essential elements of forensic analysis. The student will be able to:
	97.01 Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	97.02 Describe the forensic and evidentiary considerations when determining containment.
	97.03 Describe the types and sources of data collected for forensic analysis.
	97.04 Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.

CTE Standards and Benchmarks	
97.05	Explain the processes by which data is collected for analysis.
97.06	Describe the role of system event logs in data collection.
97.07	Describe the role of the process log in data collection.
97.08	Describe the processes associated with preserving evidence collected for forensic purposes.
97.09	Describe how the chain of custody can be maintained for evidence collected during a forensic analysis effort.

Florida Department of Education
Student Performance Standards

Course Title: **Database Security**
Course Number: **9001360**
Course Credit: **1**

Course Description:

This course focuses on strategies employed to mitigate data compromise, including design, access, and deployment of databases.

CTE Standards and Benchmarks	
98.0	Demonstrate an understanding of database design, structure, and operation. The student will be able to:
98.01	Describe a relational database and its key elements.
98.02	Describe the Entity Relationship Model (ERM) and relate how it is a factor in database security.
98.03	Describe the process of normalization and explain its role in database security.
98.04	Differentiate between one-to-many, many-to-many and one-to-one relationships.
98.05	Define referential integrity and describe its implications on database security.
98.06	Discuss the role of authentication in database security.
99.0	Demonstrate a fundamental understanding of Structured Query Language (SQL). The student will be able to:
99.01	List the capabilities of SQL SELECT statements.
99.02	Execute basic SQL statements, including SELECT, INSERT, and UPDATE.
99.03	Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
99.04	Use column aliases to rename columns in the query result.
99.05	Use SQL to display the structure of a table.
99.06	Apply SQL syntax to restrict the rows returned from a query.
99.07	Demonstrate application of the WHERE clause syntax.
99.08	Apply the proper comparison operator to return a desired result.
99.09	Create, drop, rename and truncate tables using SQL.
99.10	Create and remove an index using a SQL statement.

CTE Standards and Benchmarks	
	99.11 Create or modify users and roles using SQL statements.
	99.12 Use the GRANT and REVOKE SQL statements to control access.
	99.13 Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML) SQL statements and discuss their respective implications to database security.
100.0	Demonstrate an understanding of database security policies. The student will be able to:
	100.01 Explain the role of the Database Management System (DBMS) in maintaining database security.
	100.02 Describe three aspects of system level security related to databases (i.e., user privilege schema, user authentication, operating system level privileges).
	100.03 Describe the mechanisms that control access to and use of the database at the object level.
	100.04 Explain how role-based privilege assignment can be used as a data security model.
	100.05 Compare and contrast the implications of connecting to a database with administrator versus user privileges.
101.0	Demonstrate an understanding of database access control, functions, methods, and verification. The student will be able to:
	101.01 Compare and contrast rights and privileges as they relate to database security.
	101.02 Describe the manner in which database user rights and privileges are controlled (e.g., granted, revoked).
	101.03 Describe application access rights and discuss their role in a database security schema.
	101.04 Compare and contrast table, column, and row level security, including VIEW implications.
	101.05 Describe fine-grained access control and its use in database security.
	101.06 Describe the operation of a database firewall and explain its role in a database security schema.
	101.07 Describe how database security policies may be used to trigger security auditing events.
	101.08 Describe the various types of auditing (e.g., statement, privilege, object, fine-grained) and associated records.
102.0	Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures. The student will be able to:
	102.01 Describe the SQL Injection attack vector and explain its potential consequences (e.g., privilege escalation, data compromise, data destruction).
	102.02 Describe database inference as a vulnerability and explain how sensitive information can be compromised inadvertently.
	102.03 Discuss ways in which to prevent or limit database inference at design time and query time.
	102.04 Compare and contrast the various countermeasures and strategies to prevent an SQL injection from being successful.
	102.05 Compare and contrast the ways in which encryption might be applied to a database (i.e., database, fields, records, columns) and discuss the tradeoffs of each.
103.0	Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery. The student will be able to:

CTE Standards and Benchmarks
103.01 Describe the criteria which might be employed to trigger an intrusion or breach alarm.
103.02 Identify the sources for confirming and tracking intrusion.
103.03 Describe the tools and methodologies used to determine the scope of data compromise.
103.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
103.05 Describe the appropriate actions related to database recovery during incidence response.

Florida Department of Education
Student Performance Standards

Course Title: **Software & Application Security**
Course Number: **9001370**
Course Credit: **1**

Course Description:

This course addresses the creation of secure software applications, including identifying the vulnerabilities and mitigation strategies.

CTE Standards and Benchmarks	
104.0	Demonstrate an understanding of software design, structure, and operation. The student will be able to:
104.01	Describe a typical software application and its key elements.
104.02	Compare and contrast software quality and software security in terms of development time, testing, and implementation.
104.03	Explain how security can be a software design parameter and discuss the inherent trade-offs during the development life cycle.
104.04	Describe the common failings in software security (e.g., input handling, inadequate testing, incomplete/incorrect algorithms, memory misuse, holes for privilege escalation).
105.0	Demonstrate a fundamental understanding of common software attack vectors. The student will be able to:
105.01	Describe how buffer overflow attacks can be prevented through input validation and proper interpretation.
105.02	Describe a command injection attack, how it can occur, and the potential consequences.
105.03	Describe an SQL injection attack, how it can occur, and the potential consequences.
105.04	Describe a code injection attack, including PHP remote code injection, how it can occur, and the potential consequences.
105.05	Describe cross-site scripting attack, how it can occur, and the potential consequences.
106.0	Demonstrate an understanding input syntax validation. The student will be able to:
106.01	Explain the need for validating input syntax to ensure proper input handling.
106.02	Describe canonicalization and its role in handling alternate encoding schemas.
106.03	Discuss the risks associated with improper handling of signed or unsigned numeric input (e.g., very large data length versus negative number).
107.0	Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code. The student will be able to:
107.01	Explain why any input processing algorithm must correctly handle all problem variants.
107.02	Explain why debug or test code should be removed from all production bound software.

CTE Standards and Benchmarks	
	107.03 Describe the need for ensuring that machine instructions correctly implement the intended actions of the high-level language code.
	107.04 Describe the concept of a strongly typed programming language and explain its role in correct data interpretation.
	107.05 Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).
	107.06 Describe the race condition associated with shared memory access, its causes, and potential consequences (e.g., DOS attack causing deadlock).
108.0	Demonstrate an understanding of the role of environment variables in the operation of software applications. The student will be able to:
	108.01 Describe how the PATH, IFS, and LD_LIBRARY_PATH environment variables can be exploited.
	108.02 Explain how dynamic libraries can be subverted through the use of environment variables and describe the potential consequences (e.g., elevated privileges).
	108.03 Describe the principle of “least privilege” relative to the operation of software applications, particularly as it relates to file/directory ownership management.
109.0	Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks. The student will be able to:
	109.01 Describe a Root/Admin program and explain the development and operational benefits of partitioning the program into smaller modules.
	109.02 Identify the sources for confirming and tracking intrusion.
	109.03 Describe the tools and methodologies used to determine the scope of data compromise.
	109.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
	109.05 Describe the appropriate actions related to database recovery during incidence response.

Florida Department of Education
Student Performance Standards

Course Title: **Web Security**
Course Number: **9001380**
Course Credit: **1**

Course Description:

This course addresses the creation of secure websites and authentication applications, including identifying the vulnerabilities and mitigation strategies.

CTE Standards and Benchmarks	
110.0	Demonstrate an understanding of the primary security services used in Internet and intranet environments. The student will be able to:
110.01	Describe Secure Sockets Layer (SSL) security service.
110.02	Compare and contrast SSL with Transport Layer Security (TLS) as a security service.
110.03	Describe Internet Protocol Security (IPsec) and discuss its benefits and three functional areas (i.e., authentication, confidentiality, key management).
110.04	Describe Secure/Multipurpose Internet Mail Extension (S/MIME) and discuss its role in achieving secure Internet-based communications.
111.0	Demonstrate a fundamental understanding of the SSL protocol stack and its elements. The student will be able to:
111.01	Compare and contrast SSL Connection and SSL Session.
111.02	Describe SSL Record Protocol services and discuss their role in managing SSL exchanges (i.e., message integrity, confidentiality).
111.03	Describe the operation of the SSL Record Protocol, including the key steps that ensure security (e.g., adding message authentication code, encryption).
111.04	Explain the role of the SSL Change Cipher Spec Protocol in ensuring secure transactions.
111.05	Explain the role of the SSL Alert Protocol.
111.06	Describe the SSL Handshake Protocol and explain the role of each phase of communication (i.e., establish security capability, server authentication/key exchange, client authentication/key exchange, complete secure connection).
112.0	Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms. The student will be able to:
112.01	Compare and contrast IPsec with SSL and TSL.
112.02	Compare and contrast security services provided under IPv4 and IPv6.
112.03	Differentiate between the three facilities available under IPsec (i.e., Authentication Header, Encapsulating Security Payload, key exchange).

CTE Standards and Benchmarks	
	112.04 Describe the concept of Security Association (SA) and explain the roles of its three parameters (i.e., Security Parameters Index, IP Destination Address, Security Protocol Identifier).
	112.05 Describe the purpose, structure, and criteria of the Authentication Header (AH).
	112.06 Describe the purpose, structure, and elements of the Encapsulating Security Protocol (ESP).
	112.07 Describe the structure and operation of the key management facility of IPsec.
113.0	Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates. The student will be able to:
	113.01 Describe the role of S/MIME in conducting email communications.
	113.02 Compare and contrast the four new security functions provided by S/MIME (i.e., enveloped data, signed data, clear-signed data, and signed enveloped data).
	113.03 Outline the process of using S/MIME during email processing.
	113.04 Describe the various cryptographic algorithms used by S/MIME and discuss their applicability (i.e., DSS, RSA, SHA-1, MD5, ElGamal, AES, 3DES, HMAC).
	113.05 Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).
	113.06 Describe the need for using x.509 v3 public key certificates with S/MIME.
114.0	Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network. The student will be able to:
	114.01 Compare and contrast the roles and operation of a Kerberos Authentication Server (AS) and a Ticket Granting Server (TGS).
	114.02 Describe a Kerberos realm and the mechanism for inter-realm authentication.
115.0	Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains. The student will be able to:
	115.01 Describe the key components of identity management architecture.
	115.02 Describe the concept of identity federation and explain its benefits.
	115.03 Describe the standards used in federated identity management (i.e., XML, SOAP, WS-Security, SAML).

Florida Department of Education
Student Performance Standards

Course Title: **Applied Cybersecurity Applications**
Course Number: **9001390**
Course Credit: **1**

Course Description:

This is a project-based capstone course to provide Applied Cybersecurity students with the opportunity to apply their skills from both offensive and defensive perspectives. Students work in teams to research, plan, design, create, and configure a virtual network to prevent intrusion. Students will be expected to plan, document, perform, and report on penetration testing of a mock virtual network. This activity may take the form of a Capture the Flag (CTF) event.

The following components should be a part of this course:

Planning Conference

The teacher and all team members must participate in a planning conference. It is critical that all parties involved understand and agree on time schedules, expectations, constraints, advanced learning applications, and evaluation criteria.

Project Criteria

The following criteria shall be met when choosing the Applied Cybersecurity Applications project:

The project must allow experiences that utilize both skills and knowledge directly related to the student's “white hat” career interests in cybersecurity. Activities related to penetration testing should span the various types of tests and attack vectors.

The project must provide opportunities for members to experience a high level of interactivity related to the challenges of learning and applying advanced skills in cybersecurity.

The project must provide a safe, legal, and ethically sound environment with up-to-date facilities and equipment.

Each student must maintain a journal with daily entries, defined by the teacher, such as:

- Time spent on the project (log in and log out)
- Description of the activity for the period(s)
- Materials/equipment/fixtures used
- Obstacles/challenges/vulnerabilities identified
- Possible solutions/strategies identified
- Work/successes accomplished

- Solutions/tests attempted
- Solutions/tests that failed
- Conclusions

Each student will be expected to actively participate in creating their team's network design and penetration testing report. The teacher will create a rubric for communicating report requirements and assessing performance.

All design and penetration testing must be limited to the virtual computing environment provided to students and must be supervised and controlled by the teacher. Access to the virtual environment may be acceptable from off-campus or home computers, but is subject to approval by the teacher.

Supervision

Teacher-coordinators of the Applied Cybersecurity Applications project must monitor student activities and support learning. Students must also be evaluated a minimum of once per grading period by the teacher-coordinator. The evaluation should assess how well the student is progressing toward goals established by the teacher-coordinator. The rubric-based design and report assessment, in combination with the student journal, is a recommended method of student assessment.

CTE Standards and Benchmarks	
116.0	Complete a safety skills inventory. The student will be able to:
116.01	Practice safety procedures while enrolled in this course.
116.02	Demonstrate an understanding of safety and general policies and procedures.
117.0	Demonstrate acceptable project values. The student will be able to:
117.01	Maintain a positive relationship with peers.
117.02	Demonstrate adaptive self-management skills.
117.03	Adhere to industry accepted, legal, and ethical standards of cyber conduct.
117.04	Rotate through a wide variety of increasingly responsible experiences.
117.05	Apply superior skills in communications, mathematics, and science appropriate to technological content and learning activities.
118.0	Demonstrate the ability to detect and resolve system vulnerabilities. The student will be able to:
118.01	Prepare a vulnerability matrix to identify and record weak points, the type of vulnerability, and significance of the vulnerability, the priority, and the solution.
118.02	Determine possible solutions for each vulnerability.
118.03	Research each detected vulnerability.
118.04	Document solutions as they are devised.

CTE Standards and Benchmarks	
	118.05 Prepare an alternative for any solution that is not successful.
	118.06 Continue the process until a workable solution is found for each vulnerability.
119.0	Plan, organize, and carry out a penetration testing plan. The student will be able to:
	119.01 Determine the scope and attack vectors for the test.
	119.02 Organize the team according to individual strengths.
	119.03 Assign specific tasks within a team.
	119.04 Prioritize the attack vectors and sequence the test.
	119.05 Identify required resources.
	119.06 Carry out the testing plan to successful completion.
	119.07 Create the test report detailing the goals, tests, findings, and results.
120.0	Demonstrate proficiency in conducting forensic analysis. The student will be able to:
	120.01 Create security incident handling and response policies.
	120.02 Recover deleted, encrypted, or damaged file information as evidence for prosecution in computer crimes.
	120.03 Deploy proprietary and/or open source tools to identify intruder footprints.
	120.04 Coordinate incident response activities.
	120.05 Prepare proper documentation of chain of custody, including accounting for evidence source, destination, and possession.
	120.06 Preserve forensic integrity of evidence.
	120.07 Model highest moral and ethical standards in conducting digital forensic investigations.
121.0	Successfully work as a member of a team. The student will be able to:
	121.01 Accept responsibility for specific tasks in a given situation.
	121.02 Document progress, and provide feedback on work accomplished in a timely manner.
	121.03 Complete assigned tasks in a timely and professional manner.
	121.04 Reassign responsibilities when the need arises.
	121.05 Complete daily tasks as assigned on one’s own initiative.
122.0	Manage time according to a plan. The student will be able to:
	122.01 Set realistic time frames and schedules.

CTE Standards and Benchmarks	
	122.02 Record time worked in the daily journal.
	122.03 Meet goals and objectives set by the team.
	122.04 Identify individual priorities.
	122.05 Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.
123.0	Keep acceptable records of progress problems and solutions. The student will be able to:
	123.01 Develop a record keeping system in the form of a log book or journal to record daily progress.
	123.02 Use a project journal to identify problem statement.
	123.03 Develop a portfolio of work accomplished to include design drawings, research, drawings and plans, storyboards, models, mock-ups and prototypes.
124.0	Manage resources. The student will be able to:
	124.01 Identify required resources for each stage of the project plan.
	124.02 Determine the methods needed to acquire needed resources.
	124.03 Demonstrate good judgment in the use of resources.
	124.04 Recycle and reuse resources where appropriate.
	124.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
125.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	125.01 Identify the proper tool for a given job.
	125.02 Use tools and machines in a safe manner.
	125.03 Adhere to laboratory or job site safety rules and procedures.
	125.04 Identify the application of processes appropriate to the task at hand.
	125.05 Identify materials appropriate to their application.
126.0	Research content related to the project and document the results. The student will be able to:
	126.01 Identify the basic research needed to develop the project plan.
	126.02 Identify available resources for completing background research required in the project plan.
	126.03 Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources.
	126.04 Demonstrate the ability to organize information retrieval.
	126.05 Demonstrate the ability to prepare a topic outline.

CTE Standards and Benchmarks	
	126.06 Write a draft of the design and testing report.
	126.07 Edit and proof the respective report.
	126.08 Prepare an electronically composed report in proper form.
127.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
	127.01 Prepare a multi-media presentation on the completed project.
	127.02 Make an oral presentation, using multi-media materials.
	127.03 Review the presentation, and make changes in the delivery method(s) to improve presentation skills.
128.0	Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon. The student will be able to:
	128.01 Demonstrate a mastery of the content of the selected subject area.
	128.02 Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
	128.03 Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.
	128.04 Demonstrate the acquisition of additional knowledge, skill and experience in one area of the selected field of study beyond the performance standards of the initial program standards.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Technology Support Services**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9001400
CIP Number	0515120201
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in computer technology support positions in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills.

The content includes but is not limited to practical experiences in the implementation, management, and maintenance of advanced technology user environments.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1 Options	8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
	9001410	IT Essentials	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G	1 credit		2	CT
Course 2	9001420	Technology Support Services - Client Systems	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G	1 credit		3	CT
Course 3	9001430	Technology Support Services - Network Systems		1 credit		3	CT
Course 4	9001440	Technology Support Services - Specialized Technologies		1 credit		3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Demonstrate knowledge, skill, and application of computer systems.
11.0 Demonstrate knowledge of different operating systems.
12.0 Develop a familiarity with the information technology industry.
13.0 Develop an awareness of microprocessors and digital computers.
14.0 Develop an awareness of the different types of multi-function printers.
15.0 Develop an awareness of emerging technologies.
16.0 Demonstrate an understanding of the Open Systems Interconnection (OSI) model and the Transmission Control Protocol/ Internet Protocol (TPC/IP) model.
17.0 Identify computer components and their functions.
18.0 Demonstrate proficiency using the Internet to locate information.
19.0 Demonstrate proficiency using Hypertext Markup Language (HTML).
20.0 Demonstrate proficiency in webpage design.
21.0 Demonstrate proficiency using common software applications.
22.0 Perform email activities.
23.0 Demonstrate proficiency in using presentation software and equipment.
24.0 Perform decision-making activities in a multimedia environment.
25.0 Demonstrate proficiency with personal computer hardware.
26.0 Troubleshoot multi-function printers.
27.0 Demonstrate proficiency with installing and configuring client system hardware.
28.0 Demonstrate proficiency in troubleshooting, repair and maintenance of client systems.
29.0 Demonstrate proficiency with client operating systems and software.
30.0 Configure and perform system backup and recovery of a client system.
31.0 Explain virtualization concepts (Type I and Type II) and configure a Virtual Hard Disk (VHD) on a client system.
32.0 Demonstrate proficiency with networking.

33.0 Demonstrate an understanding of fundamental computer security.
34.0 Demonstrate proficiency with installing, configuring, and upgrading common client software applications or suites.
35.0 Demonstrate proficiency with technical support operational procedures.
36.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
37.0 Solve problems using critical thinking skills, creativity and innovation.
38.0 Use information technology tools.
39.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
40.0 Describe the importance of professional ethics and legal responsibilities.
41.0 Describe the operation of data networks.
42.0 Differentiate between various network media and topologies.
43.0 Install and configure basic network devices.
44.0 Demonstrate proficiency using basic network tools.
45.0 Demonstrate an understanding of network IP addressing and associated issues.
46.0 Demonstrate an understanding of network management tasks and methodologies.
47.0 Implement a Wireless Local Area Network (WLAN).
48.0 Demonstrate an understanding of network security threats and mitigation techniques.
49.0 Demonstrate proficiency with troubleshooting network operating systems.
50.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
51.0 Explain the importance of employability skill and entrepreneurship skills.
52.0 Configure Full Disk Encryption (FDE) software.
53.0 Identify basic cloud concepts.
54.0 Configure intranet tunneling software.
55.0 Demonstrate proficiency with cloud-based technologies.
56.0 Demonstrate proficiency in configuring and maintaining remote connections.
57.0 Perform installation, configuration, and management operations for both client and server storage.
58.0 Monitor system performance.
59.0 Optimize system performance.
60.0 Demonstrate proficiency with troubleshooting specialized network and communications devices.
61.0 Configure and maintain network-based technologies associated with providing web services.
62.0 Identify basic Artificial Intelligence (AI) concepts.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **IT Essentials**
Course Number: **9001410**
Course Credit: **1**

Course Description:

This course introduces students to the essential concepts, components, terminology, and knowledge about computers, computer systems, peripherals, and networks.

CTE Standards and Benchmarks	
10.0	Demonstrate knowledge, skill, and application of computer systems. The student will be able to:
10.01	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
10.02	Describe the types of communications and networking systems used in workplace environments.
10.03	Locate and use software application reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals.
10.04	Troubleshoot problems with computer hardware peripherals.
10.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
10.06	Demonstrate proficiency in using the basic features of browsers app.
11.0	Demonstrate knowledge of different operating systems. The student will be able to:
11.01	Identify the most common computer operating systems.
11.02	Describe and use industry accepted file naming conventions, particularly in NTFS and FAT file systems.
11.03	Demonstrate proficiency with file management tasks.
11.04	Demonstrate a working knowledge of standard file formats.
11.05	Compare and contrast various operating systems.
11.06	Differentiate between different operating systems and applications.
11.07	Compare and contrast open source and proprietary software.
11.08	Explain how system utilities are used to maintain computer performance.
12.0	Develop a familiarity with the information technology industry. The student will be able to:
12.01	Explain how information technology impacts the operation and management of business and society.

CTE Standards and Benchmarks	
	12.02 Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile, onsite technologies vs. cloud computing).
	12.03 Describe how digital technologies (social media) are changing both work and personal lifestyles.
13.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
	13.01 Describe the evolution of the digital computer.
	13.02 Explain the general architecture of a microcomputer system.
	13.03 Explain the evolution of microprocessors.
	13.04 Explain software hierarchy and its impact on microprocessors.
	13.05 Explain the need for and use of peripherals.
	13.06 Demonstrate proficiency installing and using plug-and-play peripherals.
	13.07 Identify the basic concepts of computer maintenance and upgrades.
	13.08 Distinguish between firmware and driver updates.
14.0	Develop an awareness of the different types of multi-function printers. The student will be able to:
	14.01 Describe the different types (Communication methods, USB, Wi-Fi Direct, LAN, Bluetooth).
	14.02 Explain how drivers work with printers.
	14.03 Demonstrate troubleshooting techniques to repair printers.
15.0	Develop an awareness of emerging technologies. The student will be able to:
	15.01 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer).
	15.02 Describe social media as an emerging technology.
	15.03 Adhere to published best practices for protecting personal identifiable information when using the Internet.
	15.04 Identify trends related to the use of information technology in people’s personal and professional lives.
	15.05 Characterize how the rapid pace of change in information technology impacts our society.
16.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) model and the Transmission Control Protocol/ Internet Protocol (TPC/IP) model. The student will be able to:
	16.01 Describe the evolution of the OSI model from its inception to the present, including its potential future developments, and explain how it relates to the TCP/IP model.
	16.02 Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.
	16.03 Explain the interrelations of the OSI and TCP/IP layer as it relates to hardware and software.

CTE Standards and Benchmarks	
	16.04 Describe the purpose of the OSI model and each of its layers.
	16.05 Explain specific functions belonging to each OSI model layer.
	16.06 Understand how two network nodes communicate through the OSI model.
	16.07 Discuss the structure and purpose of data packets and frames.
	16.08 Describe the two types of addressing covered by the OSI model.
17.0	Identify computer components and their functions. The student will be able to:
	17.01 Identify the internal components of a computer.
	17.02 Use common computer and DOS commands terminology.
18.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
	18.01 Identify and describe web terminology.
	18.02 Define Universal Resource Locators (URLs) and associated protocols.
	18.03 Compare and contrast the types of Internet domains.
	18.04 Describe and observe Internet/Intranet ethics and copyright laws and regulatory control.
	18.05 Trace the evolution of the Internet from its inception to the present and into the future.
	18.06 Demonstrate proficiency using search engines, including Boolean search strategies.
	18.07 Demonstrate proficiency using various web tools.
	18.08 Compare and contrast the roles of web servers and web browsers.
19.0	Demonstrate proficiency using Hypertext Markup Language (HTML). The student will be able to:
	19.01 Categorize websites according to their purpose.
	19.02 Describe the types of documents that might be used in a web environment.
	19.03 Identify elements of a webpage.
	19.04 Define basic HTML terminology.
	19.05 Critique the aesthetic and functional operation of sample websites.
	19.06 Create storyboards depicting a multi-page website.
	19.07 Design, edit, and test HTML documents for accuracy and validity.
	19.08 Create and modify webpages using a Graphical User Interface (GUI) editor.

CTE Standards and Benchmarks	
	19.09 Enhance webpages through the addition of images and graphics including animation.
	19.10 Analyze webpage source code developed by others.
	19.11 Create webpages using basic HTML tags.
20.0	Demonstrate proficiency in webpage design. The student will be able to:
	20.01 Develop an awareness of acceptable webpage design, including index pages in relation to the rest of the website.
	20.02 Describe and apply color theory as it applies to webpage design.
	20.03 Access and digitize graphics through various resources.
	20.04 Use image design software to create and edit images.
	20.05 Demonstrate proficiency in publishing to the Internet: domain selection, choosing appropriate hosting types, and implementing HTTPS and other web security measures.
	20.06 Explain the need for web-based applications.
21.0	Demonstrate proficiency using common software applications. The student will be able to:
	21.01 Compare and contrast the appropriate use of various software applications.
	21.02 Demonstrate proficiency in the use of various software applications.
22.0	Perform email activities. The student will be able to:
	22.01 Describe email capabilities and functions.
	22.02 Identify components of an email message.
	22.03 Identify deceptive/fraudulent emails.
	22.04 Identify the components of an email address.
	22.05 Identify when to use different email options.
	22.06 Attach a file to an email message.
	22.07 Forward an email message.
	22.08 Use an address book.
	22.09 Create a private email group.
	22.10 Reply to an email message.
	22.11 Use the Internet to perform email activities.
	22.12 Identify the appropriate use of email and demonstrate related email etiquette.

CTE Standards and Benchmarks	
	22.13 Identify when to include information from an original email message in a response.
	22.14 Identify common problems associated with widespread use of email.
23.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
	23.01 Produce a presentation that includes music, animation, and digital photography and present it using a projection system.
	23.02 Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
	23.03 Demonstrate knowledge of the roles and responsibilities of a multimedia production team.
	23.04 Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
	23.05 Create a self-running presentation with synchronized audio, convert presentation slides into streaming ASF files for use on the web.
24.0	Perform decision-making activities in a multimedia environment. The student will be able to:
	24.01 Determine work priorities, the audience, project budgets, project specifications, and the production schedule.
	24.02 Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks.
	24.03 Present and defend design projects.
	24.04 Evaluate criteria for selecting an operating system.

Florida Department of Education
Student Performance Standards

Course Title: **Technology Support Services – Client Systems**
Course Number: **9001420**
Course Credit: **1**

CTE Standards and Benchmarks	
25.0	Demonstrate proficiency with personal computer hardware. The student will be able to:
25.01	Categorize storage devices and backup media.
25.02	Explain motherboard components, types and features.
25.03	Classify power supplies types and characteristics.
25.04	Explain the purpose and characteristics of CPUs/GPUs and their features.
25.05	Explain cooling methods and devices.
25.06	Compare and contrast memory types, characteristics and their purpose.
25.07	Distinguish between the different display devices and their characteristics.
25.08	Summarize the function and types of adapter cards.
25.09	Distinguish between the different form factors.
26.0	Troubleshoot multi-function printers. The student will be able to:
26.01	Demonstrate proficiency with device drivers.
26.02	Troubleshoot common hardware errors.
27.0	Demonstrate proficiency with installing and configuring client system hardware. The student will be able to:
27.01	Install, configure and optimize personal computer components.
27.02	Install, configure, and optimize laptop components.
27.03	Install, configure, and optimize client system peripherals (e.g., port replicators, docking stations, and related communication protocols including Thunderbolt, USB, and others).
27.04	Demonstrate proficiency using the following tools:
	• Multimeter.
	• Power supply tester.
	• Cable testers.

CTE Standards and Benchmarks	
	• Loop back plugs.
	• Anti-static pad and wrist strap.
	• Extension magnet.
28.0	Demonstrate proficiency in troubleshooting, repairing and maintaining of client systems. The student will be able to:
28.01	Explain the troubleshooting theory.
28.02	Explain and interpret common hardware and operating system symptoms and their causes.
28.03	Determine the troubleshooting methods and tools for printers.
28.04	Explain and interpret common mobile device issues and determine the appropriate basic troubleshooting method.
28.05	Integrate common preventative maintenance techniques.
28.06	Analyze system/application logs and other system resources to identify and/or resolve performance issues related to display, disk space, and virtual memory.
28.07	Use appropriate client system tools and utilities to diagnose and resolve hardware failure issues, including hard drive sectors, memory, cabling, and BIOS.
29.0	Demonstrate proficiency with client operating systems and software. The student will be able to:
29.01	Compare and contrast the different client operating systems and their features.
29.02	Explain the steps involved in installing and configuring a client operating system, including an understanding of BIOS/UEFI security features such as Secure Boot, TPM, and encryption key management.
29.03	Explain the basics of boot sequences, methods and startup utilities.
29.04	Perform a clean installation of an operating system.
29.05	Perform a version upgrade to an existing operating system, maintaining user profiles, preferences, and historical information.
30.0	Configure and perform a system backup and recovery of a client system. The student will be able to:
30.01	Compare and contrast system backup and system imaging.
30.02	Create a system image file or backup file as appropriate.
30.03	Create system restore points.
30.04	Configure system images and backup files for automatic update.
30.05	Recover a system using either a system image file or backup file.
31.0	Explain virtualization concepts (Type I and Type II) and configure a Virtual Hard Disk (VHD) on a client system. The student will be able to:
31.01	Create, deploy, boot, mount, and update a VHD.

CTE Standards and Benchmarks	
	31.02 Perform offline updates.
	31.03 Perform offline servicing.
32.0	Demonstrate proficiency with networking. The student will be able to:
	32.01 Summarize the basics of networking fundamentals, including technologies, devices and protocols.
	32.02 Categorize network cables by function, speed, and connectors.
	32.03 Compare and contrast different types of networks, including an analysis of public and private IP addresses and their roles within each network type.
	32.04 Validate client configuration for network connectivity.
	32.05 Install and configure connectivity for a small local area network using either IPv4 or IPv6.
	32.06 Set up user accounts for a small local area network.
	32.07 Configure file and folder access using NTFS permissions and sharing.
33.0	Demonstrate an understanding of fundamental computer security. The student will be able to:
	33.01 Explain basic security concepts and technologies, including firewalls, encryption technologies, and authentication.
	33.02 Describe the following security and authentication features and technologies:
	• Advantages and disadvantages of specific wireless security types; keys; SSID; MAC filters.
	• Malicious software protection.
	• BIOS Security.
	• Password complexity.
	• Locking workstation.
	• Biometrics and physical authentication.
	• Multifactor Authentication.
	• Secure Boot.
	33.03 Discuss the basics of data sensitivity and security, including compliance, classifications, and social engineering.
	33.04 Install, configure, and launch antivirus software, isolating or removing viruses and malware as needed.
	33.05 Configure a local security policy and associated authentication and authorization rules.
	33.06 Explain data loss prevention technologies.
34.0	Demonstrate proficiency with installing, configuring, and upgrading common client software applications or suites. The student will be able to:

CTE Standards and Benchmarks	
	34.01 Validate software licensing compliance and system compatibility.
	34.02 Perform initial installation of a common software application.
	34.03 Perform an upgrade of a common software application.
	34.04 Set default Internet browser.
	34.05 Install software and/or browser add-ins.
35.0	Demonstrate proficiency with technical support operational procedures. The student will be able to:
	35.01 Adhere to safety and environmental procedures related to ESD, SMI, RFI, electrical safety, cabling, and physical/environmental.
	35.02 Describe the characteristics desired in establishing and maintaining good customer relations.
	35.03 Demonstrate appropriate communication skills and professionalism in customer interactions.
	35.04 Apply call center vocabulary.
36.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	36.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	36.02 Locate, organize and reference written information from various sources.
	36.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	36.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	36.05 Apply active listening skills to obtain and clarify information.
	36.06 Develop and interpret tables and charts to support written and oral communications.
	36.07 Exhibit public relations skills that aid in achieving customer satisfaction.
37.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	37.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	37.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	37.03 Identify and document workplace performance goals and monitor progress toward those goals.
	37.04 Conduct technical research to gather information necessary for decision-making.
38.0	Use information technology tools. The student will be able to:
	38.01 Use technology to enhance time management and increase workplace efficiency.
	38.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.

CTE Standards and Benchmarks	
	38.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	38.04 Employ collaborative/groupware applications to facilitate group work.
39.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	39.01 Describe the nature and types of business organizations.
	39.02 Explain the effect of key organizational systems on performance and quality.
	39.03 List and describe quality control systems and/or practices common to the workplace.
	39.04 Explain the impact of the global economy on business organizations.
40.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	40.01 Evaluate and justify decisions based on ethical reasoning.
	40.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	40.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	40.04 Interpret and explain written organizational policies and procedures.

Florida Department of Education
Student Performance Standards

Course Title: **Technology Support Services – Network Systems**
Course Number: **9001430**
Course Credit: **1**

CTE Standards and Benchmarks	
41.0	Describe the operation of data networks. The student will be able to:
41.01	Explain the function of common networking protocols.
41.02	Identify commonly used TCP and UDP default ports.
41.03	Identify IP address formats.
41.04	Identify the proper use of IP addressing technologies and addressing schemes.
41.05	Identify common IPv4 and IPv6 routing protocols.
41.06	Distinguish between routing and switching.
41.07	Compare the characteristics of wireless communication standards.
41.08	Distinguish between physical and logical network diagrams.
41.09	Explain the function of VLANs (virtual LANs).
42.0	Differentiate between various network media and topologies. The student will be able to:
42.01	Categorize standard cable types and their properties.
42.02	Identify common connector types.
42.03	Identify common physical network topologies.
42.04	Differentiate and implement appropriate wiring standards.
42.05	Select the appropriate media, cables, ports, and connectors to connect network devices.
42.06	Categorize WAN technology types and properties.
42.07	Categorize LAN technology types and properties.
42.08	Explain common logical network topologies and their characteristics.
42.09	Install components of wiring distribution.
43.0	Install and configure basic network devices. The student will be able to:
43.01	Install, configure and differentiate between common network devices.

CTE Standards and Benchmarks	
	43.02 Identify the functions of specialized network devices.
	43.03 Explain the advanced features of a switch.
	43.04 Implement a small switched network, including remote access management.
	43.05 Verify network status and operation using basic utilities (e.g., ping, traceroute, telnet, SSH, arp, ipconfig).
	43.06 Implement a basic wireless network.
44.0	Demonstrate proficiency using basic network tools. The student will be able to:
	44.01 Select the appropriate command line interface tool and interpret the output to verify functionality.
	44.02 Explain the purpose of network scanners.
	44.03 Utilize the appropriate hardware tools.
45.0	Demonstrate an understanding of network IP addressing and associated issues. The student will be able to:
	45.01 Assign and verify valid IP addresses in a LAN environment.
	45.02 Describe Network Address Translation (NAT) and its role in network communication.
	45.03 Distinguish between public and private IP addresses.
	45.04 Explain the operation of DHCP and DNS services and their impact on network client systems.
	45.05 Detect and correct IP addressing issues.
46.0	Demonstrate an understanding of network management tasks and methodologies. The student will be able to:
	46.01 Explain the function of each layer of the OSI model.
	46.02 Identify types of configuration management documentation.
	46.03 Evaluate the network based on configuration management documentation.
	46.04 Explain network segmentation and traffic management concepts.
	46.05 Conduct network monitoring to identify performance and connectivity issues.
	46.06 Explain different methods and rationales for network performance optimization.
	46.07 Configure updates to a network operating system to include manual, automatic, and rollback aspects.
	46.08 Implement network troubleshooting methodologies.
	46.09 Troubleshoot common connectivity issues and select an appropriate solution.
47.0	Implement a Wireless Local Area Network (WLAN). The student will be able to:

CTE Standards and Benchmarks	
	47.01 Describe the standards associated with wireless media.
	47.02 Identify and describe the purpose of the components of a small WLAN.
	47.03 Configure a small WLAN such that devices connect to the correct access point.
	47.04 Describe the security features and capabilities of WI-FI Protected Access (WPA).
	47.05 Describe common issues with implementing a WLAN and methods for addressing these issues.
48.0	Demonstrate an understanding of network security threats and mitigation techniques. The student will be able to:
	48.01 Explain the function of hardware and software security devices.
	48.02 Explain common features of a firewall, distinguishing between types of firewalls.
	48.03 Explain the methods of network access security.
	48.04 Explain methods of user authentication.
	48.05 Explain issues that affect device security.
	48.06 Implement password and physical security in a small routed network.
	48.07 Identify common security threats and mitigation techniques.
49.0	Demonstrate proficiency with troubleshooting server based operating systems. The student will be able to:
	49.01 Select the appropriate commands and options to troubleshoot and resolve problems.
	49.02 Select and use system utilities/tools appropriate to a problem and evaluate the results.
	49.03 Evaluate and resolve common issues.
50.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	50.01 Employ leadership skills to accomplish organizational goals and objectives.
	50.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	50.03 Conduct and participate in meetings to accomplish work tasks.
	50.04 Employ mentoring skills to inspire and teach others.
51.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	51.01 Identify and demonstrate positive work behaviors needed to be employable.
	51.02 Develop personal career plan that includes goals, objectives, and strategies.
	51.03 Examine licensing, certification, and industry credentialing requirements.

CTE Standards and Benchmarks	
51.04	Maintain a career portfolio to document knowledge, skills, and experience.
51.05	Evaluate and compare employment opportunities that match career goals.
51.06	Identify and exhibit traits for retaining employment.
51.07	Identify opportunities and research requirements for career advancement.
51.08	Research the benefits of ongoing professional development.
51.09	Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Technology Support Services - Specialized Technologies**
Course Number: **9001440**
Course Credit: **1**

CTE Standards and Benchmarks	
52.0	Configure Full Disk Encryption (FDE) software. The student will be able to:
52.01	Describe disk encryption and its role and benefits in computer system security.
52.02	Compare and contrast disk encryption with file system encryption.
52.03	Configure system policies to accommodate full disk encryption.
52.04	Explain the role of the Trusted Platform Module (TPM) relative to computer system identification and security.
52.05	Manage TPM startup keys.
52.06	Configure startup key storage.
52.07	Describe a Data Recovery Agent (DRA) and its role in system security.
52.08	Configure a DRA on a client and network server.
52.09	Perform data and system recovery operations.
53.0	Identify basic cloud concepts. The student will be able to:
53.01	Understand the distinction between SaaS, IaaS and PaaS.
53.02	Distinguish between cloud deployment models.
53.03	Understand cloud computing characteristics.
54.0	Configure intranet tunneling software. The student will be able to:
54.01	Describe Internet Protocol Security (IPSec) and its role in secure tunnel connectivity.
54.02	Compare and contrast the characteristics and operation of an infrastructure tunnel and an intranet tunnel.
54.03	Configure endpoints required for an intranet tunnel connection.
54.04	Configure system and user authentication for an intranet tunnel connection.
54.05	Define the requirements for establishing a network infrastructure tunnel.
54.06	Resolve tunnel connectivity issues.
55.0	Demonstrate proficiency with cloud-based technologies. The student will be able to:

CTE Standards and Benchmarks	
	55.01 Describe cloud-based technologies and their unique challenges.
	55.02 Describe fundamental services provided by the cloud: Compute Services, Storage Services, Networking Services, Database Services
	55.03 Configure offline file policies for synchronized access to network shared files.
	55.04 Describe transparent caching and explain its role in optimizing network performance, particularly mobile networks.
56.0	Demonstrate proficiency in configuring and maintaining remote connections. The student will be able to:
	56.01 Establish a Virtual Private Network (VPN) connection with authentication.
	56.02 Enabling a VPN reconnect to accommodate mobile remote users.
	56.03 Perform a Strength, Weakness, Opportunity, and Threat (SWOT) analysis of a local area network configured for remote access connectivity.
	56.04 Compare and contrast the use of quarantine and captive portals to accomplish remediation of connected devices.
	56.05 Configure NAC for wireless remote connections.
	56.06 Configure dial-up connections.
	56.07 Enable and configure remote desktop in both client and server environments.
57.0	Perform installation, configuration, and management operations for both client and server storage. The student will be able to:
	57.01 Install, initialize, and partition storage devices such as hard drives and solid-state drives, distinguishing among data storage technologies like M.2, SSDs, and hard drives.
	57.02 Describe file system fragmentation and its impact on system performance.
	57.03 Perform a file system defragmentation.
	57.04 Describe Redundant Array of Independent Disks (RAID) configuration.
	57.05 Configure removable device policies.
58.0	Monitor system performance. The student will be able to:
	58.01 Configuring event logging.
	58.02 Filtering event logs.
	58.03 Event subscriptions.
	58.04 Data collector sets.
	58.05 Generating a system diagnostics report.
59.0	Optimize system performance. The student will be able to:

CTE Standards and Benchmarks	
	59.01 Update device drivers.
	59.02 Select the appropriate NIC configuration for optimum performance.
	59.03 Create a power plan (scheme) for optimum power/energy efficiency.
	59.04 Configure performance settings under Advanced System Properties.
	59.05 Configure desktop settings and user profiles.
	59.06 Configure services and programs to resolve performance issues.
	59.07 Resolve mobile computing performance issues.
60.0	Demonstrate proficiency with troubleshooting specialized network and communications devices. The student will be able to:
	60.01 Select the appropriate commands and options to troubleshoot and resolve problems with network devices.
	60.02 Select and use system utilities/tools appropriate to a problem and evaluate the results.
	60.03 Evaluate and resolve common issues related to network connectivity, security, and performance of connected devices.
61.0	Configure and maintain network-based technologies associated with providing web services. The student will be able to:
	61.01 Configure and maintain a web server, to include setting up authentication, security certificates, and permissions for Active Server Page operation.
	61.02 Connect to a File Transfer Protocol (FTP) server, to include setting up access and permissions.
	61.03 Connect to mail transfer protocol server.
62.0	Identify basic Artificial Intelligence (AI) concepts. The student will be able to:
	62.01 Explain the key characteristics and functions of Artificial Intelligence.
	62.02 Differentiate between Generative AI and Predictive AI based on purpose and output.
	62.03 Explore AI language models and their real-world applications.
	62.04 Describe the process used to train AI models.
	62.05 Analyze how bias can be introduced into AI systems.
	62.06 Evaluate the potential consequences of using biased AI models.
	62.07 Assess the security risks and potential for misinformation when using AI tools.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Cloud Computing & Virtualization**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9001500
CIP Number	0511100312
Grade Level	9-12
Program Length	6 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1232 – Computer User Support Specialists 15-1244 – Network and Computer Systems Administrators
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Computer Support Assistant, Network Support Technician, Cloud Specialist, Cloud Virtualization Engineer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of six (6) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1232	2	CT
9001510	Computer Engineering & Support	BUS ED 1 @2 COMPU SCI 6	1 credit	15-1232	3	CT
9001520	Network Engineering & Support		1 credit	15-1244	3	CT
9001530	Essentials of Cloud Technology		1 credit	15-1244	3	CT
9001540	Basics of Cloud Computing & Virtualization*		1 credit	15-1244	3	CT
9001550	Advanced Cloud Computing & Virtualization		1 credit	15-1244	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Note: Digital Business Foundations is recommended.

*Students must take Basics of Cloud Computing & Virtualization (9001540) as a prerequisite of Advanced Cloud Computing & Virtualization (9001550).

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
11.0 Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules.
12.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment.
13.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware, and the surrounding workspace.
14.0 Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors, and memory in desktop and server computer systems.
15.0 Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems.
16.0 Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked.
17.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, internet, remote access, or direct contact.
18.0 Demonstrate proficiency using graphical user interface (GUI) operating systems.
19.0 Demonstrate language arts knowledge and skills.
20.0 Demonstrate mathematics knowledge and skills.
21.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
22.0 Participate in work-based learning experiences.
23.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact.

24.0 Perform installation and configuration activities.
25.0 Demonstrate proficiency using computer networks.
26.0 Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers.
27.0 Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability.
28.0 Demonstrate proficiency in managing, configuring and troubleshooting storage use.
29.0 Demonstrate proficiency in configuring and troubleshooting network connections.
30.0 Demonstrate proficiency in implementing, monitoring, and troubleshooting security.
31.0 Evaluate and analyze concepts used in cloud computing.
32.0 Identify the components of cloud-based services.
33.0 Evaluate cloud-based services.
34.0 Use cloud-based services.
35.0 Evaluate and analyze techniques and methods of cloud deployment, and design principles of secure cloud computing.
36.0 Evaluate the risks of cloud-based systems.
37.0 Demonstrate an awareness of cloud implementation security concepts.
38.0 Demonstrate an understanding of virtualization concepts.
39.0 Install and configure the virtualization server platform.
40.0 Install, configure and manage virtualized clients.
41.0 Demonstrate an understanding of storage technologies and storage configuration.
42.0 Demonstrate proficiency in managing a virtualization infrastructure.
43.0 Demonstrate proficiency in network optimization using network protocols, ports, and topologies
44.0 Understand security in a virtualized environment.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Computer Engineering and Support**
Course Number: **9001510**
Course Credit: **1**

Course Description:

This course is designed to develop competencies needed for employment in computer operations and technology including leadership and the ability to diagnose and resolve computer problems. The content includes instruction in basic hardware configuration, hardware and software troubleshooting, operating systems, and computer networking.

CTE Standards and Benchmarks	
10.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
10.01	Develop strategies for resolving customer conflicts.
11.0	Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. The student will be able to:
11.01	Identify and describe the functions of main processing boards (e.g., CPUs, RAM, ROM, bus architecture).
11.02	Identify and describe the functions of communication ports (e.g., serial and parallel ports).
11.03	Identify and describe the functions of peripheral devices (e.g., scanners, modems, hard drives, printers).
11.04	Identify and describe the components of portable systems (e.g., battery, LCD, AC adapter, PDAs).
11.05	Troubleshoot, install, and upgrade computers and peripherals.
11.06	Perform system hardware setup.
11.07	Demonstrate an understanding of input/output devices.
11.08	Install and configure of applications software, hardware, and device drivers.
11.09	Demonstrate an understanding of the operation and purpose of hardware components.
11.10	Install operating system software.
11.11	Customize operating systems.
11.12	Install application software.
11.13	Perform storage formatting and preparation activities.
11.14	Identify data measurement (e.g., bits, bytes, kilobytes).

CTE Standards and Benchmarks	
	11.15 Install and configure RAID.
	11.16 Recognize and report on server room environmental issues (temperature, humidity/ESD/power surges, back-up).
12.0	Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to:
	12.01 Troubleshoot a personal computer system.
	12.02 Identify configuration problems.
	12.03 Identify software problems.
	12.04 Identify hardware malfunctions.
	12.05 Identify network malfunctions.
	12.06 Resolve computer error messages.
	12.07 Understand and troubleshoot memory and cache systems.
	12.08 Verify that drives are the appropriate type.
	12.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.
13.0	Identify issues, procedures and devices for protection within the computing environment, including people, hardware, and the surrounding workspace. The student will be able to:
	13.01 Apply basic rules for hardware safety.
	13.02 Demonstrate proficiency in basic preventative hardware maintenance.
	13.03 Apply special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
	13.04 Apply ergonomic principles applicable to the configuration of computer workstations.
	13.05 Describe ethical issues and problems associated with computers and information systems.
14.0	Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors, and memory in desktop and server computer systems. The student will be able to:
	14.01 Identify EDO RAM, DRAM, SRAM, RIMM, VRAM, SDRAM, and WRAM.
	14.02 Identify memory banks, memory chips (8-bit, 16-bit, and 32-bit), SIMMS (Single In-line Memory Module), DIMMS (Dual In-line Memory Module), parity chips versus non-parity chips.
	14.03 Identify printer parallel port, COM/serial port, floppy drive, hard drive, Memory, and Boot sequence.
15.0	Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. The student will be able to:
	15.01 Identify types of printers—Laser, Inkjet, Dot Matrix.

CTE Standards and Benchmarks	
	15.02 Identify care and service techniques and common problems with primary printer types.
	15.03 Implement and manage printing on a network.
16.0	Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. The student will be able to:
	16.01 Define networking and describe the purpose of a network.
	16.02 Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards).
	16.03 Describe the various types of network topologies.
	16.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
	16.05 Configure network and verify network connectivity.
	16.06 Discuss the responsibilities of the network administrator (e.g., rights and responsibilities).
	16.07 Develop user logon procedures.
	16.08 Utilize network management infrastructures (e.g., network monitoring, alerting, security) to perform administrative tasks.
	16.09 Identify common backup strategies and procedures.
	16.10 Select and use appropriate electronic communications software and hardware for specific tasks.
	16.11 Compare and contrast Internet software and protocols.
	16.12 Diagnose and resolve electronic communications operational problems.
	16.13 Design and implement directory tree structures.
	16.14 Install services tools (SNMP, backup software).
	16.15 Perform full backup and verify backup.
	16.16 Identify bottlenecks (e.g., processor, bus transfer, I/O, disk I/O, network I/O, memory).
	16.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
	16.18 Document and test disaster recovery plan regularly, and update as needed.
17.0	Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, internet, remote access, or direct contact. The student will be able to:
	17.01 Apply call center vocabulary.
	17.02 Listen and input information simultaneously.

CTE Standards and Benchmarks	
	17.03 Apply first response assistance for minor repair work.
18.0	Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to:
	18.01 Identify parts of GUI windows.
	18.02 Create and use icons.
	18.03 Demonstrate proficiency in using menu systems.
	18.04 Demonstrate proficiency in using pointing and selection devices.
	18.05 Identify keyboard shortcuts and special function keys.
	18.06 Demonstrate proficiency in manipulating windows.
	18.07 Utilize help systems and hypertext links.
	18.08 Create, organize, and maintain file system directories.
	18.09 Organize desktop objects.
	18.10 Run multiple applications.
19.0	Demonstrate language arts knowledge and skills. The student will be able to:
	19.01 Locate, comprehend and evaluate key elements of oral and written information.
	19.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
	19.03 Present information formally and informally for specific purposes and audiences.
20.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	20.01 Demonstrate knowledge of arithmetic operations.
	20.02 Analyze and apply data and measurements to solve problems and interpret documents.
	20.03 Construct charts/tables/graphs using functions and data.

Florida Department of Education
Student Performance Standards

Course Title: **Network Engineering and Support**
Course Number: **9001520**
Course Credit: **1**

Course Description:

This course is designed to develop competencies needed for employment in network operations and technology including leadership and the ability to diagnose and resolve systemic or network computer problems. The content includes instruction in basic hardware configuration, hardware and software troubleshooting, operating systems, and computer networking.

CTE Standards and Benchmarks	
21.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
21.01	Develop diplomatic methods to communicate with customers.
22.0	Participate in work-based learning experiences. The student will be able to:
22.01	Participate in work-based learning experiences in a network support services environment.
22.02	Discuss the use of technology in a network environment.
23.0	Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact. The student will be able to:
23.01	Apply first response assistance for minor repair work.
24.0	Perform installation and configuration activities. The student will be able to:
24.01	Configure the operating system environment.
24.02	Connect client workstation running similar operating system to the network.
24.03	Configure Internet access for a network.
24.04	Configure a web server.
24.05	Use remote server to deploy operating system.
24.06	Troubleshoot failed installations.
24.07	Install and configure network services for interoperability.
24.08	Monitor, configure, troubleshoot and control access to printers.
24.09	Monitor, configure, troubleshoot and control access to files, folders, and shared folders.

CTE Standards and Benchmarks	
	24.10 Monitor, configure, troubleshoot and control access to websites.
25.0	Demonstrate proficiency using computer networks. The student will be able to:
	25.01 Identify and describe the purpose of standards; protocols; and the Open Systems Interconnection (ISO) reference model.
26.0	Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers. The student will be able to:
	26.01 Configure hardware devices.
	26.02 Configure driver signing options.
	26.03 Update device drivers.
	26.04 Troubleshoot problems with hardware.
27.0	Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability. The student will be able to:
	27.01 Monitor and optimize usage of system resources.
	27.02 Manage processes.
	27.03 Optimize disk performance.
	27.04 Manage and optimize availability of system data and user data.
	27.05 Recover systems and user data.
28.0	Demonstrate proficiency in managing, configuring and troubleshooting storage use. The student will be able to:
	28.01 Configure and manage user profiles.
	28.02 Monitor, configure and troubleshoot disks and volumes.
	28.03 Configure data compression.
	28.04 Monitor and configure disk quotas.
	28.05 Recover from disk failures.
29.0	Demonstrate proficiency in configuring and troubleshooting network connections. The student will be able to:
	29.01 Install, configure and troubleshoot shared access.
	29.02 Install, configure and troubleshoot a virtual private network.
	29.03 Install, configure and troubleshoot network protocols.
	29.04 Install and configure network services.
	29.05 Configure, monitor and troubleshoot remote access.

CTE Standards and Benchmarks	
	29.06 Install, configure, monitor and troubleshoot Terminal Services.
	29.07 Configure the properties of a connection.
	29.08 Install, configure and troubleshoot network adapters and drivers.
30.0	Demonstrate proficiency in implementing, monitoring, and troubleshooting security. The student will be able to:
	30.01 Encrypt data on a hard disk by using Encrypting File System.
	30.02 Implement, configure, manage and troubleshoot policies in an operating system environment.
	30.03 Implement, configure, manage and troubleshoot auditing.
	30.04 Implement, configure, manage and troubleshoot local accounts.
	30.05 Implement, configure, manage and troubleshoot account policy.
	30.06 Implement, configure, manage and troubleshoot security by using the Security Configuration Tool Set.

Florida Department of Education
Student Performance Standards

Course Title: **Essentials of Cloud Technology**
Course Number: **9001530**
Course Credit: **1**

Course Description:

This course is designed to develop competencies needed for employment in computer engineering including knowledge of networking, storage, and database technologies. The content includes instruction in hardware and software and developing a functional understanding of the technologies and troubleshooting methods used to support guests in a virtualization layer.

CTE Standards and Benchmarks	
31.0	Evaluate and analyze concepts used in cloud computing. The student will be able to:
31.01	Describe the evolution of cloud computing.
31.02	Describe the four main deployment models for cloud computing, public, private, community, and hybrid.
31.03	Describe the three main service models for cloud computing (SaaS, PaaS, and IaaS).
31.04	Describe cloud computing roles (cloud computing customer, cloud service provider and cloud service partner).
31.05	Describe cloud characteristics (on-demand self-service, broad network access, multi-tenancy, rapid elasticity).
31.06	Describe the role of the Internet and Building Block Technologies of virtualization, storage, networking and databases in cloud computing.
31.07	Understand and identify managed services in cloud computing.
32.0	Identify the components of cloud-based services. The student will be able to:
32.01	Demonstrate proficiency in accessing web applications through web browser.
32.02	Describe, identify and use thin clients to complete business tasks.
32.03	Describe, identify and use thick clients to complete business tasks.
32.04	Describe, identify and use mobile clients to complete business tasks.
32.05	Explain application hosting.
32.06	Describe multipurpose architecture.
33.0	Evaluate cloud-based services. The student will be able to:
33.01	Perform calculations to identify the costs and savings of different cloud based models for an organization.

CTE Standards and Benchmarks	
	33.02 Compare and contrast cloud based services used in industry.
	33.03 Identify the impacts to current and future staffing and operational needs.
	33.04 Evaluate performance of cloud-based solutions using performance indicators.
34.0	Use cloud-based services. The student will be able to:
	34.01 Compare and contrast outsourcing and cloud computing as alternatives for business.
	34.02 Identify and use cloud based services to improve productivity.
	34.03 Describe the differences between capital expenditures (CapEx) and operational expenditures (OpEx).
	34.04 Compare and contrast cloud-based services for consumer and business.
	34.05 Use cloud-based services to perform collaboration online.
	34.06 Compare and contrast the user experience in a cloud-based service and a traditional business model.
35.0	Evaluate and analyze techniques and methods of cloud deployment, and design principles of secure cloud computing. The student will be able to:
	35.01 Describe networking for cloud-based solutions.
	35.02 Describe the role of automation and self-service in regard to cloud-based solutions.
	35.03 Examine deployment and management of internal and external cloud services to complete business task.
	35.04 Describe the functional security requirements (portability, interoperability, vendor lock-in).
	35.05 Articulate the role of standardization in cloud-based solutions.
	35.06 Express the impact of cloud systems on time to market.
	35.07 Examine the distribution over the Internet in cloud deployment.
36.0	Evaluate the risks of cloud-based systems. The student will be able to:
	36.01 Identify and evaluate compliance risks relating to software and vendors in cloud-based systems.
	36.02 Describe user privacy rights and privacy risks in cloud-based systems.
	36.03 Identify system/subsystem product certifications (common criteria, FIPS I 40-2).
	36.04 Describe legal risks in cloud-based systems.
	36.05 Explain the role of vendors and dependencies in cloud-based solutions.
	36.06 Explain the risks of hardware independence.
	36.07 Identify the main aspects of identity management.

CTE Standards and Benchmarks	
37.0	Demonstrate an awareness of cloud implementation security concepts. The student will be able to:
37.01	Describe the risk of connecting a local cloud network to the public Internet Cryptography (encryption, in motion, at rest, key management).
37.02	Describe the use of a Virtual Private network access to Local Area Network.
37.03	Identify and describe the components of cloud environment, data and media sanitization (overwriting, cryptographic erase).
37.04	Describe networking topologies in cloud environment.
37.05	Describe serves, switches, and routers in cloud-based architecture.
37.06	Explain the role of the datacenter in cloud-based architecture.

Florida Department of Education
Student Performance Standards

Course Title: **Basics of Cloud Computing & Virtualization**
Course Number: **9001540**
Course Credit: **1**

Course Description:

This course is designed to develop competencies needed for employment in computer engineering including knowledge of networking, storage, and database technologies. The content includes instruction in cloud technologies and troubleshooting methods. The content will provide a foundation for skills to analyze and resolve software and/or hardware problems; diagnose and resolve complex problems and work as a team. Increased understanding of networking protocols, operating systems, software development, web protocols, device programming, or other computing and systems paradigms.

CTE Standards and Benchmarks	
38.0	Demonstrate an understanding of virtualization concepts. The student will be able to:
38.01	Describe the role of the virtual CPU in virtualization.
38.02	Describe the role of virtual memory in virtual component.
38.03	Identify the process of system patching for virtual environment.
38.04	Describe virtual desktops.
38.05	Evaluate the components of networking topology including (servers, network, storage).
38.06	Compare and contrast traditional desktops and servers to virtual counterpart.
38.07	Analyze the hardware requirements to create and scale a virtual infrastructure.
38.08	Compare and contrast traditional virtualization and para-virtualization.
38.09	Identify, describe and use guest operating system in a virtualization environment.
38.10	Identify, define and use virtual machine monitor in virtual environment.
38.11	Perform virtual partitioning through the Hypervision.
38.12	Describe bare metal approach for virtualization portioning.
38.13	Describe hosted virtualization as a virtualization approach.
38.14	Apply industry standards for hardware support for virtualization.
38.15	Explain high-level language virtual machines.

CTE Standards and Benchmarks	
	38.16 Describe the benefits of server consolidation and containment acquired through migration to virtualization.
	38.17 Describe the benefits of test and development optimization gained through virtualization.
	38.18 Demonstrate how virtualization reduces cost and complexity of high availability and disaster recovery.
	38.19 Demonstrate how virtualization can enhance security in the enterprise.
39.0	Install and configure the virtualization server platform. The student will be able to:
	39.01 Compare and contrast virtual image to a golden image.
	39.02 Create a virtual image using a virtualization platform using a base operating system.
	39.03 Create a virtual template in which the golden image is configured with the software packages and application.
	39.04 Configure the virtual template to ensure software settings and organizational polices are implemented.
	39.05 Manage inventory objects licenses using the virtual infrastructure ensure to comply with enterprise requirements.
	39.06 Demonstrate how a virtual switch is used to create communication between virtual machines.
	39.07 Perform communication between two virtual machines through the use of a virtual switch.
	39.08 Create, manage and configure virtual switches to enable communication of virtual machines in different hosts.
	39.09 Use virtual system management to remotely manage the allocation in a virtual network.
	39.10 Perform and manage user roles and permission in a virtual environment.
	39.11 Perform server patching on a virtual environment both on traditional servers as well virtual servers.
40.0	Install, configure and manage virtualized clients. The student will be able to:
	40.01 Describe peripheral redirection.
	40.02 Demonstrate proficiency in configuring virtual client to enable both USB and monitor redirection.
	40.03 Compare and contrast the use of peripherals in a traditional and virtual environment.
	40.04 Classify the types of virtual clients used in a virtualization infrastructure.
	40.05 Demonstrate proficiency in performing tasks using thin, thick and mobile virtualization clients.
	40.06 Compare and contrast the performance, ease of use and efficiency of different clients in completing business tasks.
	40.07 Analyze business tasks that are better aligned to a particular virtualization client type.
	40.08 Demonstrate proficiency in managing user sessions and policies of virtual clients.
41.0	Demonstrate an understanding of storage technologies and storage configuration. The student will be able to:

CTE Standards and Benchmarks	
41.01	Describe the evolution of storage architecture and data center components.
41.02	Describe, identify and use data center elements host, connectivity and storage.
41.03	Identify describe, and use RAID technology in an enterprise environment.
41.04	Identify the impact to application performance based on RAID implementation.
41.05	Describe an intelligent storage system.
41.06	Compare and contrast storage systems for a virtualization infrastructure.
41.07	Compare and contrast various storage network technologies. (e.g., Fibre Channel Storage Network FC Scan, IP Scan, Fibre Channel over Ethernet, Network Attached Storage, Object Based, Unified Storage)
41.08	Identify the appropriate storage network solutions based on client requirements.
41.09	Demonstrate proficiency in creating and managing data stores.
41.10	Demonstrate proficiency in configuring and managing resource pools.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Cloud Computing & Virtualization**
Course Number: **9001550**
Course Credit: **1**

This course is designed to develop competencies needed for employment in computer engineering including knowledge of networking, storage, and database technologies. The content includes instruction in cloud technologies and troubleshooting methods. The content will allow students to demonstrate their ability to analyze and resolve software and/or hardware problems; diagnose and resolve complex problems and work as a team. Experiential learning is designed to increase students' understanding of networking protocols, operating systems, software development, web protocols, device programming, or other computing and systems paradigms.

CTE Standards and Benchmarks	
42.0	Demonstrate proficiency in managing a virtualization infrastructure. The student will be able to:
42.01	Describe the process of cloning virtual machines.
42.02	Identify the benefits of cloning in a virtual infrastructure.
42.03	Compare and contrast full clones and linked clones.
42.04	Demonstrate proficiency in identifying situations in which cloning is a proper solution.
42.05	Demonstrate proficiency in deploying virtual machines using cloning.
42.06	Describe virtual migration.
42.07	Describe the situational needs that require a virtual migration.
42.08	Identify the role of network bandwidth and resource allocation needed for virtual migration.
42.09	Demonstrate an understanding of automating migration to the host server.
42.10	Identify the process that migration affect virtual disk storage in particular SANS.
42.11	Demonstrate proficiency in developing action steps to execute a virtual migration.
43.0	Demonstrate proficiency in network optimization using network protocols, ports, and topologies. The student will be able to:
43.01	Describe disaster recovery (business continuity) information availability for virtualized and non-virtualized environments.
43.02	Demonstrate proficiency in backup and recovery in both virtualized and non-virtualized environments.
43.03	Explain deduplication technology for backup optimization.
43.04	Identify fixed content storage requirements and archival solutions.

CTE Standards and Benchmarks	
	43.05 Describe continuous data replication and remote replication in virtualized and non-virtualized environments.
	43.06 Demonstrate proficiency in integrating Active Directory to a virtual environment.
	43.07 Demonstrate proficiency in CPU and memory optimization.
	43.08 Demonstrate proficiency using remote desktops and display protocols to optimize network infrastructure.
	43.09 Describe fault tolerance and acceptable levels tolerated based on the infrastructure.
44.0	Understand security in a virtualized environment. The student will be able to:
	44.01 Compare and contrast hosted and Bare-Metal virtualization implementations vulnerability to threats and attacks.
	44.02 Identify data leakage and malicious code intrusion.
	44.03 Demonstrate proficiency in securing data between guest and host environments.
	44.04 Demonstrate proficiency in managing resource allocation in a virtualized environment to reduce system crash.
	44.05 Demonstrate proficiency in creating images that are secure for client deployment.
	44.06 Identify software security levels and digital signatures.
	44.07 Demonstrate proficiency in using, configuring and managing host firewall in a virtualized infrastructure.
	44.08 Demonstrate proficiency in using command line to configure and manage the host firewall.
	44.09 Demonstrate proficiency in using logging tools to monitor activity in the virtual environment.
	44.10 Identify, describe and provide solutions to threats based on scalability and high availability.
	44.11 Demonstrate proficiency in securing mobile, thin and thick clients.
	44.12 Explain threats to network authentication in a virtualized environment.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

This program is a replacement for Applied Cybersecurity # 9001300 (0511100315).

Program Title: **Applied Cybersecurity**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9001600
CIP Number	0511100317
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1212 – Information Security Analysts
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and cybersecurity-related careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of cybersecurity.

The content includes but is not limited to foundational knowledge and skills in computer and network security, security vulnerabilities, attack mechanisms and techniques, intrusion detection and prevention, cryptographic systems, system hardening, risk identification, incidence response, penetration testing, key management, access control, and recovery. Specialized courses focus on database security, planning and analysis, software, and web security.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1	9001310	IT Fundamentals	BUS ED 1 @2 COMPU SCI 6 CYBER TECH 7G INFO TECH 7G	1 credit	15-1212	2	CT
Course 2	9001320	Computer and Network Security Fundamentals		1 credit	15-1212	3	CT
Course 3	9001330	Cybersecurity Essentials		1 credit	15-1212	3	CT
Course 4 Options	9001340	Operational Cybersecurity		1 credit	15-1212	3	CT
	9001610	Cybersecurity Capstone		1 credit	15-1212	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

IT Fundamentals

01.0 Demonstrate knowledge, skill, and application of computer systems.
02.0 Demonstrate knowledge of different operating systems.
03.0 Develop familiarity with the information technology industry.
04.0 Develop an awareness of microprocessors and digital computers.
05.0 Develop an awareness of programming languages.
06.0 Develop an awareness of emerging technologies.
07.0 Demonstrate an understanding of the Open Systems Interconnection (OSI) models.
08.0 Demonstrate an understanding of the TCP/IP model.
09.0 Identify computer components and their functions.
10.0 Demonstrate proficiency using the Internet to locate information.
11.0 Demonstrate an understanding of Internet safety and ethics.
12.0 Demonstrate proficiency using common software applications.
13.0 Perform email activities.
14.0 Demonstrate proficiency in using presentation software and equipment.
15.0 Perform decision-making activities in a multimedia environment.
16.0 Demonstrate language arts knowledge and skills.
17.0 Demonstrate mathematics knowledge and skills.
18.0 Demonstrate science knowledge and skills.

Computer and Network Security Fundamentals

19.0 Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications.
20.0 Describe the national agencies and supporting initiatives involved in cybersecurity.
21.0 Discuss the underlying concepts of terms used in cybersecurity.
22.0 Demonstrate an understanding of basic computer components, their functions, and their operation.
23.0 Demonstrate knowledge of different operating systems.
24.0 Demonstrate an understanding of the Open Systems Interface (OSI) model.
25.0 Demonstrate an understanding of the TCP/IP model.
26.0 Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model.
27.0 Demonstrate proficiency using computer networks.
28.0 Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections
29.0 Demonstrate an understanding of basic security concepts.
30.0 Demonstrate an understanding of legal and ethical issues in cybersecurity.
31.0 Demonstrate an understanding of virtualization technology.
32.0 Recognize and understand the administration of remote access technologies.
33.0 Understand the application of concepts of physical security.

34.0 Securely configure and maintain the following types of devices.
35.0 Understand the societal and security challenges of emerging technologies.
36.0 Recognize and be able to differentiate and explain access control models.
37.0 Understand the security concerns for media.
38.0 Explain the following security topologies as they relate to cybersecurity.
39.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
40.0 Solve problems using critical thinking skills, creativity and innovation.
41.0 Use information technology tools.
42.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
43.0 Describe the importance of professional ethics and legal responsibilities.

Cybersecurity Essentials

44.0 Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges.
45.0 Demonstrate awareness of cybersecurity- specific agencies and the tools they provide.
46.0 Demonstrate knowledge of risk management concepts and terminology, including roles and tolerances.
47.0 Demonstrate an understanding of common information and computer system security vulnerabilities.
48.0 Demonstrate knowledge of open- source tools, including the advantages and disadvantages of each.
49.0 Demonstrate an understanding of common cyberattack mechanisms, their consequences, and motivation for their use.
50.0 Demonstrate an understanding of artificial intelligence (AI) and its advantages and disadvantages to cybersecurity.
51.0 Be able to identify and explain the following different kinds of cryptographic algorithms.
52.0 Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity.
53.0 Understand how cryptography and digital signatures address the following security concepts.
54.0 Understand and be able to explain the following concepts of PKI (Public Key Infrastructure).
55.0 Demonstrate an understanding of certificates and their role in cybersecurity.
56.0 Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation.
57.0 Demonstrate an understanding of Intrusion Detection Systems (IDS).
58.0 Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
59.0 Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
60.0 Demonstrate an understanding of IDS applications.
61.0 Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques.
62.0 Demonstrate an understanding of firewalls and other means of intrusion prevention.
63.0 Demonstrate an understanding of vulnerabilities unique to virtual computing environments.
64.0 Demonstrate an understanding of cloud computing and how it can be used in cybersecurity.
65.0 Demonstrate an understanding of social engineering and its implications to cybersecurity.
66.0 Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability.
67.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
68.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
69.0 Explain the importance of employability and entrepreneurship skills.

Operational Cybersecurity

70.0 Demonstrate an understanding of how to configure host systems to guard against cyber intrusion.
71.0 Demonstrate an understanding of AAA/IAM methods and strategies.
72.0 Demonstrate an understanding of methods and strategies for controlling access to computer networks.
73.0 Describe physical security controls and their importance in protecting IT infrastructure and data.
74.0 Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured.
75.0 Demonstrate an understanding of the processes involved in hardening a computer system or network.
76.0 Explain how one can use scripting tools in cybersecurity.
77.0 Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations.
78.0 Demonstrate an understanding of the importance of security in the Software Development Life Cycle (SDLC).
79.0 Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization.
80.0 Explain the importance of security awareness training and its role in preventing social engineering attacks and promoting a security-conscious culture.
81.0 Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes.
82.0 Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase.

Cybersecurity Capstone

83.0 Demonstrate proficiency in cybersecurity risk mitigation planning.
84.0 Demonstrate proficiency in establishing a risk management framework.
85.0 Demonstrate proficiency in creating a corporate security policy.
86.0 Demonstrate proficiency in addressing process risks.
87.0 Demonstrate proficiency in addressing physical security risks.
88.0 Demonstrate proficiency in cybersecurity contingency planning.
89.0 Demonstrate proficiency in cybersecurity disaster recovery planning.
90.0 Demonstrate proficiency in cybersecurity business continuity planning.
91.0 Demonstrate proficiency in the essential elements of forensic analysis.
92.0 Demonstrate an understanding of database design, structure, and operation.
93.0 Demonstrate a fundamental understanding of Structured Query Language (SQL).
94.0 Demonstrate an understanding of database security policies.
95.0 Demonstrate an understanding of database access control, functions, methods, and verification.
96.0 Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures.
97.0 Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery.
98.0 Demonstrate an understanding of software design, structure, and operation.
99.0 Demonstrate a fundamental understanding of common software attack vectors.
100.0 Demonstrate an understanding input syntax validation.
101.0 Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code.
102.0 Demonstrate an understanding of the role of environment variables in the operation of software applications.
103.0 Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks.
104.0 Demonstrate an understanding of the primary security services used in Internet and intranet environments.
105.0 Demonstrate a fundamental understanding of the SSL/TLS protocol stack and its elements.

106.0 Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms.
107.0 Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates.
108.0 Demonstrate an understanding of Kerberos, LDAP, Radius and other protocols and the role in third-party authentication in a distributed network.
109.0 Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains.
110.0 Complete a safety skills inventory.
111.0 Demonstrate acceptable project values.
112.0 Demonstrate the ability to detect and resolve system vulnerabilities.
113.0 Plan, organize, and carry out a penetration testing plan.
114.0 Demonstrate proficiency in conducting forensic analysis.
115.0 Successfully work as a member of a team.
116.0 Manage time according to a plan.
117.0 Keep acceptable records of progress, problems and solutions.
118.0 Manage resources.
119.0 Use tools, materials, and processes in an appropriate and safe manner.
120.0 Research content related to the project and document the results.
121.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
122.0 Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon.

Florida Department of Education
Student Performance Standards

Course Title: **IT Fundamentals**
Course Number: **9001310**
Course Credit: **1**

Course Description:

This course introduces students to the essential concepts, components, terminology, and knowledge about computers, computer systems, peripherals, and networks.

CTE Standards and Benchmarks	
01.0	Demonstrate knowledge, skill, and application of computer systems. The student will be able to:
01.01	Describe and use current and emerging computer technology and software to perform personal and business-related tasks.
01.02	Describe the types of communications and networking systems used in workplace environments.
01.03	Locate and use software application reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals.
01.04	Troubleshoot problems with computer hardware peripherals.
01.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
01.06	Demonstrate proficiency in using the basic features of GUI browsers.
01.07	Configure computer systems to protect against various low-level attacks.
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Identify the most common computer operating systems.
02.02	Describe and use industry accepted file naming conventions; particularly in NTFS, ext4, FAT, and ReFS file systems.
02.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
02.04	Demonstrate a working knowledge of standard file formats.
02.05	Compare and contrast various operating systems (e.g., Android iOS, Windows, Mac, and Linux).
02.06	Differentiate between different operating systems and applications.
02.07	Compare and contrast open source and proprietary software.
02.08	Explain how system utilities are used to maintain computer performance.
02.09	Evaluate criteria for selecting an operating system.

CTE Standards and Benchmarks	
	02.10 Configure various operating systems from their default settings to low, medium, and high security level settings.
03.0	Develop familiarity with the information technology industry. The student will be able to:
	03.01 Explain how information technology impacts the operation and management of business and society.
	03.02 Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile).
	03.03 Describe how digital technologies (social media) are changing both work and personal lifestyles.
	03.04 Demonstrate an understanding of configuring social media used for business to meet various business requirements.
	03.05 Demonstrate an awareness of Cloud based infrastructure including SaaS (Software as a Service) and their impact on the IT industry.
04.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
	04.01 Explain software hierarchy and its impact on microprocessors as it relates to the limitation and/or increase in security.
	04.02 Explain the need for, and use of, peripherals and how they can compromise security.
	04.03 Demonstrate proficiency installing and using plug-and-play peripherals and explain their associated security risks.
	04.04 Identify the basic concepts of computer maintenance and upgrades and their relevance as it relates to security.
05.0	Develop an awareness of programming languages. The student will be able to:
	05.01 Explain the need for and use of compilers.
	05.02 Identify the three types of programming design approaches (e.g., top-down, structured, object-oriented).
	05.03 Compare the various types or classes of programming languages (e.g., compiled, interpretive).
	05.04 Differentiate among source code, machine code, interpreters, and compilers.
	05.05 Characterize the major categories of programming languages and how they are used.
	05.06 Create a model flowchart for a computer program using software applications like RAPTOR or MS VISIO.
	05.07 Describe the stages in the software development life cycle and explain how to successfully implement them.
	05.08 Compare security and vulnerabilities of various programming languages.
06.0	Develop an awareness of emerging technologies. The student will be able to:
	06.01 Compare and contrast emerging technologies and describe how they impact the security of business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, vehicles, home networks, peer-to-peer, IoT, embedded systems, AI).
	06.02 Adhere to published best practices for protecting personal identifiable information when using the Internet.
	06.03 Identify trends related to the secure use of information technology in people's personal and professional lives.
	06.04 Characterize how the rapid pace of change in information technology impacts our society's ability to keep the appropriate level of

CTE Standards and Benchmarks	
	security.
07.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) models. The student will be able to:
07.01	Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.
07.02	Describe the purpose of the OSI model and each of its layers.
07.03	Explain specific functions belonging to each OSI model layer.
07.04	Understand how two network nodes communicate through the OSI model.
07.05	Discuss the structure and purpose of data packets and frames.
07.06	Describe the two types of addressing covered by the OSI model.
08.0	Demonstrate an understanding of the TCP/IP model. The student will be able to:
08.01	Explain the interrelations of the four layers of the TCP/IP model as it relates to hardware and software.
08.02	Describe the purpose of the TCP/IP model and each of its layers.
08.03	Explain specific functions belonging to each TCP/IP model layer.
08.04	Understand how two network nodes communicate through the TCP/IP model.
08.05	Describe the two types of addressing covered by the TCP/IP model.
09.0	Identify computer components and their functions. The student will be able to:
09.01	Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
09.02	Use common computer and programming terminology.
10.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
10.01	Identify and describe web terminology.
10.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto) and their associated secure protocols (e.g. https, ftps, ssh).
10.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
10.04	Demonstrate proficiency using search engines, including Boolean search strategies.
10.05	Demonstrate proficiency using various secure web tools (e.g., downloading of files, transfer of files, SSH, PDF).
10.06	Compare and contrast the roles of web servers and web browsers.
10.07	Compare and contrast MS Web Servers and Linux Web Servers.
11.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:

CTE Standards and Benchmarks	
11.01	Describe cyber-bullying and its impact on perpetrators and victims.
11.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.
11.03	Describe risks associated with sexting, related legal issues, social engineering aspects, prevention methods, and reporting of offenses.
11.04	Describe the risks associated with online gaming and ways to reduce these risks.
11.05	Describe the intellectual property rights, ethics and legalities of downloading music or videos from the Internet.
11.06	Describe various risks associated with social networking sites and ways to reduce these risks.
11.07	Describe the risks associated with various conferencing programs and ways to reduce these risks.
11.08	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.
12.0	Demonstrate proficiency using common software applications. The student will be able to:
12.01	Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, email, presentation, database, scheduling, financial management, Java applet, music).
12.02	Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, email, presentation, database, scheduling, financial management, Java applet, music).
13.0	Perform email activities. The student will be able to:
13.01	Describe email capabilities and functions.
13.02	Identify components of an email message.
13.03	Identify the components of an email address.
13.04	Identify when to use different email options.
13.05	Attach a file to an email message.
13.06	Forward an email message.
13.07	Use an address book if an address book is available via the school's Outlook server for the student to use.
13.08	Reply to an email message.
13.09	Use the Internet to perform email activities.
13.10	Identify the appropriate use of email and demonstrate related email etiquette.
13.11	Recognize a fraudulent email and deal with it appropriately.
13.12	Identify common problems associated with widespread use of email.
13.13	Create folders to organize email.

CTE Standards and Benchmarks	
14.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
14.01	Produce a presentation that includes music, animation, and digital photography and present it using appropriate technology.
14.02	Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
14.03	Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g., project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers).
14.04	Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
14.05	Create a self-running presentation with synchronized audio, convert presentation slides (e.g., PowerPoint) into streaming ASF files for use on the web.
15.0	Perform decision-making activities in a multimedia environment. The student will be able to:
15.01	Determine work priorities, the audience, project budgets, project specifications, and the production schedule.
15.02	Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks.
15.03	Present and defend design projects.
16.0	Demonstrate language arts knowledge and skills. The student will be able to:
16.01	Locate, comprehend and evaluate key elements of oral and written information.
16.02	Draft, revise, and edit written business technology documents using correct grammar, punctuation and vocabulary (e.g., Business Continuity and Disaster Recovery plan, Incident Response plan, IT reports and procedures manuals).
16.03	Present information formally and informally to instruct others on Computer Security Awareness and Victim Prevention.
17.0	Demonstrate mathematics knowledge and skills. The student will be able to:
17.01	Demonstrate knowledge of arithmetic operations.
17.02	Construct charts/tables/graphs using functions and data and relate it to IT risk and business continuity.
17.03	Demonstrate an understanding of binary numbers and ASCII characters.
18.0	Demonstrate science knowledge and skills. The student will be able to:
18.01	Discuss the role of creativity in constructing scientific questions, methods and explanations.
18.02	Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.

Florida Department of Education
Student Performance Standards

Course Title: **Computer and Network Security Fundamentals**
Course Number: **9001320**
Course Credit: **1**

Course Description:

This course introduces students to cybersecurity and provides them with essential computer and networking knowledge and skills, particularly those related to cybersecurity.

CTE Standards and Benchmarks	
19.0	Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications. The student will be able to:
19.01	Define cybersecurity.
19.02	Describe how information security evolved into cybersecurity and the impact of the Internet on the pace and nature of evolution.
19.03	Describe the individual elements that comprise the CIA triad (i.e., Confidentiality, Integrity, Availability).
19.04	Define and explain the various types of hackers and the role each plays in cybersecurity.
19.05	Describe various methodologies used by hackers and the basis for their employment.
19.06	Describe the individual elements of the AAA model (Authentication, Authorization and Accounting).
20.0	Describe the national agencies and supporting initiatives involved in cybersecurity. The student will be able to:
20.01	Describe the role of the National Security Agency.
20.02	Describe current trends in cyberattacks and strategies for combating them.
20.03	Describe the legal implications of computer hacking and other forms of cyberattacks.
20.04	Understand the importance of the weekly bulletins distributed by the United States Computer Emergency Readiness Team (US-CERT).
20.05	Determine if any software or hardware on a given network has vulnerabilities outlined in the most recent US-CERT bulletin.
21.0	Discuss the underlying concepts of terms used in cybersecurity. The student will be able to:
21.01	Differentiate between cybersecurity and information assurance.
21.02	Define confidentiality and give examples of security breaches.
21.03	Define integrity and give examples of security breaches.
21.04	Define authenticity and give examples of security breaches.

CTE Standards and Benchmarks	
	21.05 Define accountability (non-repudiation) and give examples of security breaches.
22.0	Demonstrate an understanding of basic computer components, their functions, and their operation. The student will be able to:
	22.01 Describe the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	22.02 Demonstrate and understanding of common computer and programming terminology.
	22.03 Explain the physical and logical architecture of a microcomputer system.
	22.04 Describe the file types used in the operation of a computer.
	22.05 Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management).
23.0	Demonstrate knowledge of different operating systems. The student will be able to:
	23.01 Compare operating system file naming conventions.
	23.02 Describe the common elements that comprise the architecture of an operating system (e.g., kernel, file manager, memory manager, device manager, network manager).
	23.03 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	23.04 Demonstrate a working knowledge of standard file formats.
	23.05 Describe the purpose of various operating systems (e.g., Windows, Mac, iOS, Android and Linux).
	23.06 Describe the difference between client and network operating systems.
	23.07 Differentiate between different operating systems and applications and Macros.
	23.08 Explain the basics of boot sequences, methods and startup utilities.
	23.09 Compare and contrast open source and proprietary software.
	23.10 Describe common system utilities used in performing computer maintenance.
24.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) model. The student will be able to:
	24.01 Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.
	24.02 Describe the purpose of the OSI model and each of its layers.
	24.03 Explain specific functions belonging to each OSI model layer.
	24.04 Understand how two network nodes communicate through the OSI model.
	24.05 Discuss the structure and purpose of data packets and frames.
	24.06 Describe the two types of addressing covered by the OSI model.
25.0	Demonstrate an understanding of the TCP/IP model. The student will be able to:

CTE Standards and Benchmarks	
	25.01 Explain the interrelations of the four layers of the TCP/IP model as it relates to hardware and software.
	25.02 Describe the purpose of the TCP/IP model and each of its layers.
	25.03 Explain specific functions belonging to each TCP/IP model layer.
	25.04 Understand how two network nodes communicate through the TCP/IP model.
	25.05 Describe the two types of addressing covered by the TCP/IP model.
26.0	Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model. The student will be able to:
	26.01 Describe the services and protocols used in the OSI Application Layer (i.e., DHCP, DNS, FTP, HTTP, SMTP, Telnet, IMAP).
	26.02 Describe the services and protocols used in the OSI Transport Layer (i.e., TCP, TLS/SSL, UDP).
	26.03 Describe the services and protocols used in the OSI Network Layer (i.e., IP, ICMP, IGMP, IPsec).
	26.04 Describe the services and protocols used in the OSI Data Link Layer (i.e., ARP, OSPF, L2TP, PPP).
27.0	Demonstrate proficiency using computer networks. The student will be able to:
	27.01 Define networking and describe the purpose of a network.
	27.02 Describe the conceptual background of digital networks and cloud computing including terminology and basics.
	27.03 Describe various types of networks and the advantages and disadvantages of each (e.g., peer to peer, client/server, server/thin client, ROI).
	27.04 Describe the use, advantages, and disadvantages of various network media (e.g. coaxial, twisted pair, fiber optics).
	27.05 Describe the function of various network devices (e.g., managed switch, switched hub or switch, router, bridge, gateway, access points, modem).
	27.06 Describe how network devices are identified (i.e., IP addressing).
	27.07 Explain the protocols commonly used in a network environment.
	27.08 Differentiate between public and private IP addresses.
	27.09 Describe the common ports and corresponding protocols used in a network.
	27.10 Describe the difference between the Internet and intranet.
	27.11 Compare and contrast IPv4 and IPv6.
	27.12 Compare and contrast the different methods for network connectivity (e.g., broadband, wireless, Bluetooth, cellular).
	27.13 Discuss the differences between Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Virtual Local Area Network (VLAN), and Virtual Private Network (VPN).
28.0	Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections.

CTE Standards and Benchmarks	
	28.01 Describe the various types of cloud computing (IaaS, PaaS, SaaS) and modes of delivery (Public, Private, Community, Hybrid).
	28.02 Describe practices that aid in protecting the Hybrid cloud model.
	28.03 Describe the challenges and solutions associated with securing embedded devices.
29.0	Demonstrate an understanding of basic security concepts. The student will be able to:
	29.01 Distinguish between vulnerability and a threat.
	29.02 Discuss the different types of attacks (e.g., active, passive).
	29.03 Define security policy and explain its role in cybersecurity.
	29.04 Describe the basic methods of authentication (e.g., password, biometrics, smart cards. two-factor authentication, multifactor authentication).
	29.05 Describe the various forms of encryption methodologies (e.g., symmetric, asymmetric, block cipher, stream cipher).
	29.06 Describe hash functions and their role in authentication.
	29.07 Describe various methods of access control used in computer security (e.g., policies, groups, Access Control List (ACL).
	29.08 Understand the concept of malware (i.e., ransomware, worms, viruses, adware) and how attackers use it to steal sensitive or confidential information.
30.0	Demonstrate an understanding of legal and ethical issues in cybersecurity. The student will be able to:
	30.01 Define cybercrime and discuss the challenges facing law enforcement.
	30.02 Identify the key legislative acts that impact cybersecurity.
	30.03 Describe the Federal criminal code related to computers and give examples of cybercrimes and penalties, particularly those involving inappropriate access.
	30.04 Discuss the concept of digital forensics and its place in cybercrime investigations and incident response.
	30.05 Distinguish among the Intellectual Property Rights of trademark, patent, and copyright.
	30.06 Explain digital rights management and the implications of the Digital Millennium Copyright Act (DMCA).
	30.07 Describe the implications of various social media on the safeguarding of personal or sensitive information.
	30.08 Describe various safeguards that can be employed to help ensure that sensitive or confidential information is not inadvertently divulged or obtained.
31.0	Demonstrate an understanding of virtualization technology. The student will be able to:
	31.01 Define virtual computing.
	31.02 Explain the benefits of virtual computing.
	31.03 Differentiate between guest and host operating systems.

CTE Standards and Benchmarks	
	31.04 Install desktop virtualization software.
	31.05 Describe the role of the hypervisor.
	31.06 Create and upgrade a virtual machine.
	31.07 Optimize the performance of a virtual machine.
	31.08 Preserve the state of a virtual machine.
	31.09 Clone, move and share virtual machines.
	31.10 Use basic (static) and dynamic virtual disks and disk drives.
	31.11 Configure a virtual network.
	31.12 Connect devices to a virtual machine.
	31.13 Enable security settings on a virtual machine.
32.0	Recognize and understand the administration of remote access technologies. The student will be able to:
	32.01 Configure 802.1x authentication for a given scenario.
	32.02 Connect clients to a VPN.
	32.03 Understand Authentication, Authorization and Accounting (AAA) management.
	32.04 Differentiate between TACACS+ (Terminal Access Controller Access Control System) and RADIUS.
	32.05 Differentiate between Layer 2 Tunneling Protocol (L2TP) and Point-to-Point Tunneling Protocol (PPTP) protocols as they apply to VPN options.
	32.06 Implement the use of SSH (Secure Shell).
	32.07 Implement the use of IPsec (Internet Protocol Security).
	32.08 Identify vulnerabilities associated with authentication.
	32.09 Understand ways to implement VoIP technologies.
	32.10 Demonstrate the use and purpose of Kerberos.
33.0	Understand the application of concepts of physical security. The student will be able to:
	33.01 Configure access controls including biometric devices, keypads and security tokens.
	33.02 Recognize social engineering attempts.
	33.03 Evaluate environmental controls (e.g., EMI shielding, temperature, humidity and fire suppression).
	33.04 Develop a method of training users to recognize, report, and avoid social engineering attempts.

CTE Standards and Benchmarks	
	33.05 Identify components of physical security, including mantraps, motion detection, alarm systems, locks, video surveillance, and fences/barricades.
	33.06 Install a camera for a video surveillance system.
	33.07 Configure an alarm system including a keypad and motion detector.
	33.08 Recognize vulnerabilities associated with physical security.
	33.09 Explain how a mantrap is used as a counter measure against tailgating.
34.0	Securely configure and maintain the following types of devices. The student will be able to:
	34.01 Configure and maintain software and hardware firewalls.
	34.02 Configure and secure routers.
	34.03 Apply security settings to switches.
	34.04 Configure and secure wireless devices.
	34.05 Secure a LAN connected to a DSL/cable modem.
	34.06 Configure a RAS (Remote Access Server) for remote connectivity.
	34.07 Securely deploy a PBX (Private Branch Exchange).
	34.08 Explain the benefits of implementing a VPN (Virtual Private Network).
	34.09 Deploy IDS (intrusion detection system) and IPS (intrusion prevention systems).
	34.10 Analyze the performance, efficiency and security of the network based on network monitoring and diagnostic software.
	34.11 Employ techniques used to lock down workstations.
	34.12 Configure and secure servers for a given scenario.
	34.13 Understand and assess the security of mobile devices including but not limited to those using the Android, iOS and Windows platforms.
35.0	Understand the societal and security challenges of emerging technologies. The student will be able to:
	35.01 Explain the security implications of the Internet of Things (IoT) (i.e., understand the efforts to address authentication and updates to IoT devices).
	35.02 Explain societal and security challenges associated with robotics.
	35.03 Explain security challenges associated with serverless computing.
	35.04 Explain societal and security challenges associated with the implementation of 5G.
	35.05 Describe and explain the security challenges of Autonomous vehicles (i.e., the significance of vehicular cybersecurity and its relation to computer vision, artificial intelligence, machine learning and deep learning).

CTE Standards and Benchmarks	
36.0	Recognize and be able to differentiate and explain access control models. The student will be able to:
36.01	Understand access control as it applies to MAC (Mandatory Access Control).
36.02	Understand access control as it applies to DAC (Discretionary Access Control).
36.03	Understand access control as it applies to RBAC (Role Based Access Control).
37.0	Understand the security concerns for media. The student will be able to:
37.01	Understand and identify security concerns with the use of Coaxial Cable.
37.02	Identify and understand security concerns for UTP/STP (Unshielded Twisted Pair/Shielded Twisted Pair).
37.03	Identify and understand security concerns fiber optic cable.
37.04	Identify security concerns associated with removable media.
37.05	Address pitfalls associated with tape backups.
37.06	Apply drive encryption to hard drives.
37.07	Secure flash drives.
37.08	Smartcards and secure USB memory.
38.0	Explain the following security topologies as they relate to cybersecurity. The student will be able to:
38.01	Determine Security Zones.
38.02	Point out vulnerabilities in a DMZ (Demilitarized Zone).
38.03	Explain the security benefits of using an intranet.
38.04	Explain the security benefits of using an extranet.
38.05	Secure a VLAN (Virtual Local Area Network).
38.06	Describe the security benefits associated with NAT (Network Address Translation).
38.07	Justify the implementation of tunneling, for security purposes.
39.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
39.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
39.02	Locate, organize and reference written information from various sources.
39.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
39.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.

CTE Standards and Benchmarks	
	39.05 Apply active listening skills to obtain and clarify information.
	39.06 Develop and interpret tables and charts to support written and oral communications.
	39.07 Exhibit public relations skills that aid in achieving customer satisfaction.
40.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	40.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	40.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	40.03 Identify and document workplace performance goals and monitor progress toward those goals.
	40.04 Conduct technical research to gather information necessary for decision-making.
41.0	Use information technology tools. The student will be able to:
	41.01 Use personal information management (PIM) applications to increase workplace efficiency.
	41.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	41.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	41.04 Employ collaborative/groupware applications to facilitate group work.
42.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	42.01 Describe the nature and types of business organizations.
	42.02 Explain the effect of key organizational systems on performance and quality.
	42.03 List and describe quality control systems and/or practices common to the workplace.
	42.04 Explain the impact of the global economy on business organizations.
43.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	43.01 Evaluate and justify decisions based on ethical reasoning.
	43.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	43.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	43.04 Interpret and explain written organizational policies and procedures.
	43.05 Display proficiency in using team-oriented collaboration and video teleconferencing software (e.g. Teams, Zoom).

Florida Department of Education
Student Performance Standards

Course Title: **Cybersecurity Essentials**
Course Number: **9001330**
Course Credit: **1**

Course Description:

This course provides students with insight into the many variations of vulnerabilities, attack mechanisms, intrusion detection systems, and some methods to mitigate cybersecurity risks, including certificate services and cryptographic systems.

CTE Standards and Benchmarks	
44.0	Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges. The student will be able to:
44.01	Explain the various elements that make up the security taxonomy used by the U.S. Computer Emergency Readiness Team (CERT).
44.02	Describe the challenges associated with achieving and maintaining computer security.
44.03	Discuss the range of potential consequences of various forms of security breaches.
44.04	Describe various defense mechanisms, techniques, and methodologies (e.g., antivirus, anti-malware, protocol analyzers and scans, analyzing email headers, patch management).
44.05	Compare and contrast mechanisms employed in passive and active cyberattacks.
44.06	Describe vulnerabilities associated with each element of the CIA Triad.
44.07	Explain the differences between hardware, software, data, and network assets susceptible to cyber-attack.
44.08	Describe the tools and technologies used in cybersecurity.
44.09	Define intrusion detection and discuss its role in cybersecurity (e.g., HIDS and NIDS).
44.10	Explain what is meant by the term countermeasures (e.g., NIPS and HIPS).
44.11	Describe the role recovery plays in cybersecurity (e.g., Business Continuity Plan).
45.0	Demonstrate awareness of cybersecurity-specific agencies and the tools they provide. The student will be able to:
45.01	Identify key cybersecurity agencies, such as CISA, NIST, DHS, FBI, and NSA.
45.02	Describe the purpose and function of key cybersecurity tools and resources provided by these agencies, such as NIST CSF, NIST RMF, CISA's Known Exploited Vulnerabilities Catalog, CVE Database, CISA's Shields Up website, NIST's National Vulnerability Database, etc.
45.03	Explain how key cybersecurity agencies and tools contribute to the overall cybersecurity landscape.

CTE Standards and Benchmarks	
	45.04 Discuss how individuals and organizations can leverage these resources to improve their cybersecurity posture.
46.0	Demonstrate knowledge of risk management concepts and terminology, including roles and tolerances. The student will be able to:
	46.01 Define key risk management concepts, such as risk, threat, vulnerability, impact, likelihood, risk assessment, risk response, risk mitigation, risk acceptance, risk avoidance, risk transfer, and residual risk.
	46.02 Explain the role of different stakeholders in risk management, including business owners, risk owners, security professionals, and senior management.
	46.03 Define and differentiate between risk appetite and risk tolerance.
	46.04 Explain how risk management concepts are applied in the context of cybersecurity.
	46.05 Describe the importance of continuous monitoring and review in risk management.
47.0	Demonstrate an understanding of common information and computer system security vulnerabilities. The student will be able to:
	47.01 Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, and organizational).
	47.02 Describe the ways in which various social networks are cybersecurity targets.
	47.03 Describe foot printing and explain how it is used to reveal system vulnerabilities.
	47.04 Explain why default values and technical controls are points of vulnerability and describe the hardening efforts being taken by government and industry.
	47.05 Describe the process of port scanning and explain why it is so prevalent in cybersecurity.
	47.06 Describe what is meant by password strength and explain its relationship to vulnerability.
	47.07 Distinguish between a weak and a strong password.
	47.08 Describe some of the ways in which intruders can cover their tracks.
	47.09 Describe the circumstances under which a computer system is vulnerable to a denial-of-service attack.
48.0	Demonstrate knowledge of open-source tools, including the advantages and disadvantages of each. The student will be able to:
	48.01 Define open-source software (OSS) and its core principles, including its definition, community-driven development, and licensing.
	48.02 Identify popular categories of open-source tools used in cybersecurity subjects such as network security, endpoint security, vulnerability scanning, penetration testing, and security information and event management (SIEM).
	48.03 Analyze the advantages of using open-source tools in cybersecurity (cost effectiveness, flexibility, customization, community support, transparency, security).
	48.04 Evaluate the disadvantages of using open-source tools in cybersecurity (maintenance challenges, support variability, security risks, compatibility issues, and hidden costs).
	48.05 Compare and contrast open-source tools with commercial alternatives in specific cybersecurity use cases.
	48.06 Discuss the importance of responsible disclosure and vulnerability management in the open-source community.

CTE Standards and Benchmarks	
49.0	Demonstrate an understanding of common cyberattack mechanisms, their consequences, and motivation for their use. The student will be able to:
49.01	Describe spoofing as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.02	Describe the introduction of malware or spyware as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.03	Describe the use of grayware as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.04	Describe the use of computer viruses or worms as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.05	Describe Logic Bombs as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.06	Describe botnet and rootkit as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.07	Describe the introduction of a Trojan horse as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.08	Describe DNS poisoning as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.09	Describe buffer overflow as an attack mechanism and discuss its consequences and common motivating factors for its use.
49.10	Understand the risk associated with a zero-day exploit.
49.11	Understand risks associated with P2P networking including the Gnutella protocol and Torrents.
49.12	Describe the use of ransomware as an attack mechanism and discuss its consequences and common motivating factors for its use.
50.0	Demonstrate an understanding of artificial intelligence (AI) and its advantages and disadvantages to cybersecurity. The student will be able to:
50.01	Define artificial intelligence (AI) and its relevant subfields in cybersecurity (AI, ML, DL, NLP).
50.02	Explain the advantages of using AI in cybersecurity (enhanced threat detection, improved incident response, vulnerability management, predictive analysis, efficiency and automation).
50.03	Discuss the disadvantages and challenges of using AI in cybersecurity (adversarial AI, data dependence, false positives/negatives).
50.04	Describe specific examples of how AI is used in cybersecurity tools and technologies (SIEM, EDR, anti-malware, phishing detection, network security).
50.05	Discuss the ethical considerations of using AI in cybersecurity, such as bias, privacy, and accountability.
50.06	Analyze the potential impact of AI on the future of cybersecurity and the role of cybersecurity professionals.
51.0	Be able to identify and explain the following different kinds of cryptographic algorithms. The student will be able to:
51.01	Demonstrate the use and purpose of hashing functions.
51.02	Demonstrate the use and purpose of symmetric keys.
51.03	Demonstrate the use and purpose of asymmetric keys.

CTE Standards and Benchmarks	
52.0	Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity. The student will be able to:
52.01	Network steganographic methods (e.g., WLAN).
52.02	Digital steganographic methods (e.g., image encryption, audio, mimic functions, video, packet manipulation).
52.03	Understand how steganographic methods are used in malware.
53.0	Understand how cryptography and digital signatures address the following security concepts. The student will be able to:
53.01	Provide examples of confidentiality.
53.02	Provide examples of integrity.
53.03	Provide examples of authentication.
53.04	Provide examples of non-repudiation.
53.05	Provide examples of access control.
54.0	Understand and be able to explain the following concepts of PKI (Public Key Infrastructure). The student will be able to:
54.01	Provide examples of certificates (e.g., policies, practice statements).
54.02	Provide examples of revocation.
54.03	Provide examples of trust models.
55.0	Demonstrate an understanding of certificates and their role in cybersecurity. The student will be able to:
55.01	Describe the role of a Certificate Authority (CA).
55.02	Describe Registration Authority (RA) and its relevance to security certificates.
55.03	Compare and contrast SSL/TSL X.509-compliant certificates with PGP-compliant certificates.
55.04	Describe the events that make up the lifecycle of a certificate.
55.05	Describe how root certificate distribution works.
55.06	Describe the role of a Certificate Revocation List (CRL).
55.07	Describe the role of the Online Certificate Status Protocol (OCSP).
56.0	Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation. The student will be able to:
56.01	Define intrusion.
56.02	Describe the classes of intruders (i.e., masquerader, misfeasor, clandestine user).
56.03	Describe what is meant by a hacker and discuss their role in cybersecurity.

CTE Standards and Benchmarks	
	56.04 Compare and contrast the “black hat”, “white hat”, “blue hat”, and “grey hat” hacker cultures (i.e., computer criminal versus computer security expert).
	56.05 Describe various techniques used by hackers to achieve intrusion.
	56.06 Describe the difference between an inside and an outside attack.
57.0	Demonstrate an understanding of Intrusion Detection Systems (IDS). The student will be able to:
	57.01 Describe the three logical components of IDS (i.e., sensors, analyzers, user interface).
	57.02 Explain how user behavior relates to the detection of an intruder.
	57.03 Describe the essential requirements for any IDS.
58.0	Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
	58.01 Describe anomaly detection, specifically threshold and profile-based approaches.
	58.02 Describe the types of audit records employed in intrusion detection (i.e., native, detection-specific).
	58.03 Describe signature detection, specifically rule-based anomaly and penetration identification approaches.
59.0	Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
	59.01 Describe the primary approach for intrusion detection in a network.
	59.02 Compare and contrast inline and passive sensors.
	59.03 Discuss typical placement of sensors in a network-based IDS environment and explain the rationale for each.
60.0	Demonstrate an understanding of IDS applications. The student will be able to:
	60.01 Describe the operation, typical activities, and outputs of an intrusion detection system.
	60.02 Describe some of the limitations of intrusion detection systems.
	60.03 Differentiate between an intrusion detection system (passive) and an intrusion prevention (reactive) system.
	60.04 Compare and contrast several of the intrusion detection systems available on the current market.
61.0	Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques. The student will be able to:
	61.01 Describe the process of monitoring/detecting port scanning attacks and associated patterns.
	61.02 Explain how the monitoring and analysis of network traffic can be used to detect intrusion.
	61.03 Utilize network monitoring and analysis tools to detect intrusion and anomalies.
62.0	Demonstrate an understanding of firewalls and other means of intrusion prevention. The student will be able to:
	62.01 Describe the purpose and limitations of firewalls.

CTE Standards and Benchmarks	
	62.02 Describe the four types of firewalls (i.e., packet filtering, stateful inspection, application-level gateway, circuit-level gateway).
	62.03 Describe the use of honeypots as an intrusion prevention technique.
	62.04 Explain how security policies are used to prevent intruders.
	62.05 Explain how Access Control Lists (ACLs) are used to prevent intrusion.
63.0	Demonstrate an understanding of vulnerabilities unique to virtual computing environments. The student will be able to:
	63.01 Describe the limitations of traffic monitoring within virtual networks.
	63.02 Discuss the primary vulnerability of virtual operating systems.
	63.03 Describe the “hypervisor” and explain its role in securing a virtual environment.
64.0	Demonstrate an understanding of cloud computing and how it can be used in cybersecurity. The student will be able to:
	64.01 Define cloud computing and its key characteristics (on-demand self-service, broad network access, resource pooling, rapid elasticity, etc.).
	64.02 Identify different cloud service models (IaaS, PaaS, SaaS)
	64.03 Explain how cloud computing can be used in cybersecurity (SIEM, DLP, email security, threat intelligence, vulnerability scanning, etc.
	64.04 Discuss the security benefits of using cloud computing (scalability, flexibility, centralized management, increased redundancy)
	64.05 Analyze the security challenges associated with cloud computing (shared responsibility, data security and privacy, vendor lock-in, compliance, etc.)
	64.06 Describe best practices for securing cloud environments
65.0	Demonstrate an understanding of social engineering and its implications to cybersecurity. The student will be able to:
	65.01 Define social engineering and describe its role in cybersecurity.
	65.02 Discuss common mechanisms that constitute social engineering (e.g., phishing, baiting, quid pro quo, pretexting).
	65.03 Describe the variety of attacks targeting the human element.
	65.04 Describe countermeasures that can be used to counter social engineering attacks.
66.0	Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability. The student will be able to:
	66.01 Discuss the three over-arching security design principles (i.e., only necessary, simple, ease of use).
	66.02 Describe the principle of least privilege as it relates to computer security.
	66.03 Describe the principle of separation of duties as it relates to computer security.
	66.04 Describe the principle of defense in depth as it relates to computer security.

CTE Standards and Benchmarks	
	66.05 Describe the principle of fail secure or fail safe and false positive or false negative as it relates to computer security.
	66.06 Describe the principle of economy of mechanism as it relates to computer security.
	66.07 Describe the principle of complete mediation as it relates to computer security.
	66.08 Describe the principle of open design as it relates to computer security.
	66.09 Describe the principle of the least common mechanism as it relates to computer security.
	66.10 Describe the principle of psychological acceptability as it relates to computer security.
	66.11 Describe the principle of leveraging existing components as it relates to computer security.
	66.12 Describe the principle of weakest link as it relates to computer security.
	66.13 Describe the principle of a single point of failure as it relates to computer security.
67.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	67.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	67.02 Explain emergency procedures to follow in response to workplace accidents.
	67.03 Create a disaster and/or emergency response plan.
68.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	68.01 Employ leadership skills to accomplish organizational goals and objectives.
	68.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	68.03 Conduct and participate in meetings to accomplish work tasks.
	68.04 Employ mentoring skills to inspire and teach others.
69.0	Explain the importance of employability and entrepreneurship skills. The student will be able to:
	69.01 Identify and demonstrate positive work behaviors needed to be employable.
	69.02 Develop personal career plan that includes goals, objectives, and strategies.
	69.03 Examine licensing, certification, and industry credentialing requirements.
	69.04 Maintain a career portfolio to document knowledge, skills, and experience.
	69.05 Evaluate and compare employment opportunities that match career goals.
	69.06 Identify and exhibit traits for retaining employment.
	69.07 Identify opportunities and research requirements for career advancement.

CTE Standards and Benchmarks
69.08 Research the benefits of ongoing professional development.
69.09 Examine and describe entrepreneurship opportunities as a career planning option.

Florida Department of Education
Student Performance Standards

Course Title: **Operational Cybersecurity**
Course Number: **9001340**
Course Credit: **1**

Course Description:

This course provides students with insight into the many ways in which computer systems can be secured, countermeasures implemented, and risk assessment performed.

CTE Standards and Benchmarks	
70.0	Demonstrate an understanding of how to configure host systems to guard against cyber intrusion. The student will be able to:
70.01	Describe the security features and options available for configuring network routers to prevent intrusion.
70.02	Describe the various types of firewalls (i.e., packet filtering, stateful, application-level gateway, circuit-level gateway) and how each can be used to prevent intrusion.
70.03	Explain the configuration and operation of a Demilitarized Zone (DMZ) host, including the key services contained within the zone.
70.04	Describe the role of security zones, content filters, subnets, and trusted zones in configuring a network infrastructure.
71.0	Demonstrate an understanding of AAA/IAM methods and strategies. The student will be able to:
71.01	Describe the strengths, vulnerabilities, and countermeasures related to the use of passwords for authentication.
71.02	Describe ways in which passwords are compromised and techniques/models for strengthening.
71.03	Explain token authentication methods (e.g., memory cards, smart cards) and limitations.
71.04	Discuss the use of biometrics (i.e., facial recognition, fingerprint, hand geometry, retinal pattern, iris, signature, voice) as an authentication strategy, including its advantages, limitations, vulnerabilities, and countermeasures.
71.05	Describe the challenges associated with remote user authentication, including unique vulnerabilities and corresponding and effective countermeasures.
71.06	Demonstrate an understanding single-sign on and other authentication efforts, such as passkey and FIDO.
72.0	Demonstrate an understanding of methods and strategies for controlling access to computer networks. The student will be able to:
72.01	Compare and contrast the three primary categories of access control (i.e., discretionary, mandatory, role-based).
72.02	Describe the underlying principles of authorization as an access control mechanism applicable to individuals, system services, subjects, and objects.
72.03	Discuss the key features of an access control system (i.e., reliable input, granularity, least privilege, separation of duty, open/close policies, conflict resolution, administration).

CTE Standards and Benchmarks	
	72.04 Describe the three elements of access control (i.e., subject, object, rights).
	72.05 Describe access rights (i.e., read, write, execute, delete, create, search) and their use in establishing individual and group access control policies.
	72.06 Compare and contrast the use, operation, and limitations of Access Control Matrix (ACM), Access Control Lists (ACLs), and Capability Tickets in a network environment.
	72.07 Describe the UNIX file access control schema.
	72.08 Explain the relationship between security policies and access control.
	72.09 Describe the use and conceptual operation of formal security policy models (e.g., Bell-La Padula (BLP), Chinese Wall Model (CWM), Harrison Ruzzo Ullman (HRU)).
	72.10 Describe the use, strengths, and vulnerabilities of group policies in access control and strategies for ensuring safety.
	72.11 Describe the key entities, relationships, and functions that comprise Role-Based Access Control (RBAC), including privilege management considerations.
73.0	Describe physical security controls and their importance in protecting IT infrastructure and data. The student will be able to:
	73.01 Define physical security and its role in a comprehensive security program (including layered security).
	73.02 Identify common types of physical security controls (perimeter security, building security, data center security) and how they can be used to prevent unauthorized access, protect against environmental threats, ensure business continuity, and maintain compliance.
	73.03 Discuss the potential consequences of inadequate physical security (data breaches, theft and vandalism, service disruption, etc.)
74.0	Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured. The student will be able to:
	74.01 Describe the operation of Dynamic Host Configuration Protocol (DHCP), its vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
	74.02 Describe the operation of the Domain Name System (DNS) service, its role in a network environment, its vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
	74.03 Describe the operation of the Simple Mail Transport Protocol (SMTP), its role in a network environment, its vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
	74.04 Describe the operation of the File Transfer Protocol (FTP) and Telnet, their role in a network environment, their vulnerabilities, typical cyberattacks, and potential countermeasure strategies.
75.0	Demonstrate an understanding of the processes involved in hardening a computer system or network. The student will be able to:
	75.01 Describe hardening and some of the general approaches for securing a computer network.
	75.02 Describe and apply the process by which a web server is hardened against their typical cyberattacks.
	75.03 Describe and apply the process by which a mail server is hardened against their typical cyberattacks.
	75.04 Describe and apply the process by which an FTP server is hardened against their typical cyberattacks.

CTE Standards and Benchmarks	
	75.05 Describe and apply the process by which a file/print server is hardened against their typical cyberattacks.
	75.06 Describe and apply the process by which data repositories are hardened against their typical cyberattacks.
	75.07 Describe and apply the process by which Directory Services are hardened against their typical cyberattacks.
	75.08 Describe and apply the process by which various network appliances are hardened against their typical cyberattacks.
	75.09 Demonstrate and apply the process by which remote protocols are hardened against their typical cyberattacks.
76.0	Explain how one can use scripting tools in cybersecurity.
	76.01 Define scripting and its benefits in cybersecurity.
	76.02 Identify common scripting languages used in cybersecurity.
	76.03 Explain how scripting tools are used in various cybersecurity domains.
	76.04 Demonstrate basic scripting skills by writing simple scripts to perform common cybersecurity tasks (e.g. ping sweep, port scanning, file analysis).
	76.05 Explain the importance of using scripting tools responsibly and ethically in cybersecurity.
	76.06 Discuss the role of scripting in automating security operations and improving the efficiency of security teams.
77.0	Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations. The student will be able to:
	77.01 Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.
	77.02 Describe key escrow, its role in key management, its advantages, and its risks.
	77.03 Differentiate between key backup and key escrow.
	77.04 Explain the role of a key’s expiration date, its implications on the key’s validity, and its relationship to deactivation.
	77.05 Describe the circumstances under which a key might be revoked, who has authority to revoke a key, and how revocation is communicated.
	77.06 Compare and contrast key suspension and key revocation.
	77.07 Describe ways in which key recovery might be achieved, who is authorized to recover keys, and associated vulnerabilities to attack.
	77.08 Compare and contrast key renewal and key replacement, who is authorized to initiate renewal or replacement, and associated vulnerabilities to attack.
	77.09 Describe the circumstances under which a key might be destroyed, the considerations prior to destruction, and associated vulnerabilities to compromise or attack.
78.0	Demonstrate an understanding of the importance of security in the Software Development Life Cycle (SDLC).
	78.01 Define the Software Development Life Cycle (SDLC) and its phases (planning, requirements gathering, design, implementation, testing, deployment, maintenance).

CTE Standards and Benchmarks	
	78.02 Explain why security should be integrated into every phase of the SDLC.
	78.03 Identify security activities and tools used throughout the SDLC (threat modeling, SAST, DAST, SCA, code reviews, penetration testing).
	78.04 Explain the benefits of a secure SDLC.
79.0	Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization. The student will be able to:
	79.01 Describe the process of asset identification relative to risk assessment and the considerations or criteria used in identifying assets requiring protection and understand how to leverage a configuration management database (CMDB) for asset management.
	79.02 Describe the process of threat identification, including identifying the types of threats, asset vulnerabilities, and threat sources.
	79.03 Describe the process of risk assessment, including determination of attack probability, attack consequences, and assignment of risk priorities.
	79.04 Evaluate an existing security posture and identify gaps and vulnerabilities in security.
	79.05 Describe the role of governance, risk, and compliance in achieving a more secure organization.
	79.06 Describe the concepts of Key Performance Indicators and Risk Measurement. (e.g., annualized loss expectancy (ALE), annual rate of occurrence (ARO), single loss expectancy (SLE), Exposure Factor (EF).)
	79.07 Analyze and apply data and measurements to solve business problems and relate it to IT risk and business continuity.
80.0	Explain the importance of security awareness training and its role in preventing social engineering attacks and promoting a security-conscious culture. The student will be able to:
	80.01 Define security awareness training and its objectives, including purpose, target audience, and key goals.
	80.02 Explain the role of security awareness training in preventing social engineering attacks, such as phishing, baiting, pretexting, and tailgating.
	80.03 Describe how security awareness training promotes a security-conscious culture by increasing awareness, encouraging responsibility, promoting best practices, building confidence, and reinforcing policies.
	80.04 Identify key elements of effective security awareness training programs, including engaging content, regular training, assessment, and evaluation.
	80.05 Discuss the benefits of a security-conscious culture, such as reduced security incidents, improved compliance, enhanced reputation, increased productivity, and stronger security posture.
81.0	Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes. The student will be able to:
	81.01 Describe the types of penetration tests (i.e., human, physical, wireless, data networks, telecommunications), the goals of each type, the metrics tested, and the value of their results.
	81.02 Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
	81.03 Define attack vector and explain its relationship and importance to penetration testing.

CTE Standards and Benchmarks	
81.04	Describe common testing methodologies and standards used in penetration testing.
81.05	Describe the salient points, structure, detail, and documentation typically addressed in reporting and debriefing the results of penetration testing.
81.06	Detect malicious and abnormal activities through logs, intrusion detection systems, and other utilities and appliances.
81.07	Reproduce methods that intruders use to gain unauthorized access to a network system for purposes of compromising information assets.
81.08	Deploy proprietary and/or open-source tools to test known technical vulnerabilities in networked systems.
81.09	Determine which vulnerabilities are exploitable and estimate the risk and impact of potential exploitations.
81.10	Recommend appropriate mitigation procedures against discovered vulnerabilities and security gaps.
81.11	Model the ethics of a licensed Penetration Tester or Computer Security Specialist.
82.0	Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase. The student will be able to:
82.01	Describe the activities that make up the Preparation Phase of the Incident Response Life Cycle (e.g., identification of useful tools and resources, setting up a war room, securing communications, creating a governance team, identifying key stakeholders for response activities).
82.02	Describe the activities that make up the Detection and Analysis Phase of the Incident Response Life Cycle, including identification of indication sources, analysis of resulting signs of an intrusion event, documentation, and notification of the incident.
82.03	Describe the factors to consider when prioritizing an incident.
82.04	Describe the activities that make up the Containment, Eradication, and Recovery Phase of the Incident Response Life Cycle, including selecting a containment strategy, collecting and preserving evidence for forensic analysis (including chain of custody), identifying the attacker, re-securing the system, and system restoration.
82.05	Describe the activities that make up the Post Incident Activity Phase of the Incident Response Life Cycle, including identification of lessons learned and evidence retention.

Florida Department of Education
Student Performance Standards

Course Title: **Cybersecurity Capstone**
Course Number: **9001610**
Course Credit: **1**

Course Description:
This advanced capstone course is designed for students to integrate and apply their cybersecurity knowledge in real-world scenarios, focusing on critical areas such as application security, web security, and database protection.

Planning Conference
The teacher and all team members must participate in a planning conference. It is critical that all parties involved understand and agree on time schedules, expectations, constraints, advanced learning applications, and evaluation criteria.

Project Criteria
The following criteria shall be met when choosing the Applied Cybersecurity Applications project:

The project must allow experiences that utilize both skills and knowledge directly related to the student's “white hat” career interests in cybersecurity. Activities related to penetration testing should span the various types of tests and attack vectors.

The project must provide opportunities for members to experience a high level of interactivity related to the challenges of learning and applying advanced skills in cybersecurity.

The project must provide a safe, legal, and ethically sound environment with up-to-date facilities and equipment.

Each student must maintain a journal with daily entries, defined by the teacher, such as:

- Time spent on the project (log in and log out)
- Description of the activity for the period(s)
- Materials/equipment/fixtures used
- Obstacles/challenges/vulnerabilities identified
- Possible solutions/strategies identified
- Work/successes accomplished
- Solutions/tests attempted
- Solutions/tests that failed
- Conclusions

Each student will be expected to actively participate in creating their team’s network design and penetration testing report. The teacher will create a rubric for communicating report requirements and assessing performance.

All design and penetration testing must be limited to the virtual computing environment provided to students and must be supervised and controlled by the teacher. Access to the virtual environment may be acceptable from off-campus or home computers, but is subject to approval by the teacher.

Supervision
Teacher-coordinators of the Applied Cybersecurity Applications project must monitor student activities and support learning. Students must also be evaluated a minimum of once per grading period by the teacher-coordinator. The evaluation should assess how well the student is progressing toward goals established by the teacher-coordinator. The rubric-based design and report assessment, in combination with the student journal, is a recommended method of student assessment.

CTE Standards and Benchmarks	
83.0	Demonstrate proficiency in cybersecurity risk mitigation planning. The student will be able to:
83.01	Describe the major activities and security controls that are implemented as part of a sound risk management program.
83.02	Discuss the rationale for executive sponsorship and delineated management responsibilities in successfully implementing a risk management program.
84.0	Demonstrate proficiency in establishing a risk management framework. The student will be able to:
84.01	Describe the importance of creating a system definition for use in assessing vulnerabilities and risks.
84.02	Describe the major elements of a system definition.
84.03	Differentiate among critical assets, cyber assets, and critical cyber assets.
84.04	Explain why cyber assets are classified as public, restricted, confidential, or private and why this plays a role in creating a risk management framework.
84.05	Compare and contrast the classes of cyber assets (i.e., public, restricted, confidential, private) and give examples of each.
84.06	Create a system definition that identifies all cyber assets, their class, and their risk category (e.g., critical).
84.07	Describe an Electronic Security Perimeter (ESP) and discuss its role in formulating a risk management framework.
84.08	Describe the process and goals of a vulnerability assessment of ESP access points.
84.09	Define risk level and explain the variabilities of its components.
84.10	Describe ways in which system vulnerability may be ranked according to impact (e.g., safety, outage, privacy, monetary).
84.11	Describe some of the security controls (e.g., access control, training, audit, configuration, maintenance) that come into play when determining the appropriate risk mitigation strategy.
84.12	Compare and contrast a top-down and a bottoms-up analysis approach for identifying and mitigating risks.
84.13	Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
84.14	Create a risk management framework.
85.0	Demonstrate proficiency in creating a corporate security policy. The student will be able to:

CTE Standards and Benchmarks	
	85.01 Describe the best practices and security controls that typify a sound corporate security policy.
	85.02 Discuss the elements of a corporate security policy, including policy management, personnel and training, critical asset management, ESP, physical security, incident reporting and response, disaster recovery and business continuity plans.
	85.03 Describe the need for specific implementation and enforcement processes as part of a corporate security policy.
	85.04 Explain the controls required for addressing personnel risks in a corporate security policy (e.g., training, hiring due diligence, enforcement of “least privilege,” access revocation).
86.0	Demonstrate proficiency in addressing process risks. The student will be able to:
	86.01 Describe the best practices and security controls typically implemented for assessing and mitigating operational risks, including.
	• Conduct periodic posture risk assessments.
	• Enforce access control, monitoring, and logging.
	• Perform disposal/redeployment of assets.
	• Enforce change control and configuration management.
	• Conduct vulnerability assessments.
	• Control, monitor, and log all access to assets.
	• Configuration and maintenance.
	• Ensure incident-handling processes.
	• Provide for contingency planning.
	86.02 Create an organized mitigation table that identifies operational or process risks, the potential impact of the risk, and specific actions required to mitigate the risk.
87.0	Demonstrate proficiency in addressing physical security risks. The student will be able to:
	87.01 Describe the best practices and security controls that ensure good physical security of critical infrastructure and assets.
	87.02 Discuss the resulting potential for compromise once physical security is breached.
	87.03 Create an organized mitigation table that identifies physical security risks, the potential impact of the risk, and specific actions required to mitigate the risk.
88.0	Demonstrate proficiency in cybersecurity contingency planning. The student will be able to:
	88.01 Define resiliency and its relationship to contingency planning.
	88.02 Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
	88.03 Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, Appendices).

CTE Standards and Benchmarks	
	88.04 Describe the contingency planning process and the rationale for each step in the process.
	88.05 Explain the three step process for conducting a business impact analysis (i.e., determine recovery criticality, identify resource requirements, identify recovery priorities).
	88.06 Compare and contrast Maximum Tolerable Downtime (MTD), Recovery Time Objective (RTO), and Recovery Point Objective (RPO).
	88.07 Discuss the criteria typically used to activate the contingency plan.
	88.08 Discuss the role of backup and recovery considerations in contingency planning.
	88.09 Create a contingency plan that includes roles and responsibilities, a business impact analysis with contingency strategies/solutions, outage assessment, resource recovery priorities, backup and recovery strategies, and testing/training considerations.
89.0	Demonstrate proficiency in cybersecurity disaster recovery planning. The student will be able to:
	89.01 Describe the purpose and scope of a cybersecurity disaster recovery plan.
	89.02 Describe various recovery strategies according to their appropriateness.
	89.03 Explain the key considerations when formalizing a disaster recovery plan.
	89.04 Discuss the role of data collection relative to disaster recovery.
	89.05 Identify the types, purposes, and role of documentation during disaster recovery.
	89.06 Discuss the role of testing in a disaster recovery plan.
90.0	Demonstrate proficiency in cybersecurity business continuity planning. The student will be able to:
	90.01 Describe the purpose and scope of a cybersecurity business continuity plan.
	90.02 Explain the concept of fault tolerance and discuss its role in business continuity planning.
	90.03 Identify and use various utilities employed for the purpose of business continuity.
	90.04 Describe the role of backups for ensuring business continuity.
91.0	Demonstrate proficiency in the essential elements of forensic analysis. The student will be able to:
	91.01 Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	91.02 Describe the forensic and evidentiary considerations when determining containment.
	91.03 Describe the types and sources of data collected for forensic analysis.
	91.04 Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
	91.05 Explain the processes by which data is collected for analysis.
	91.06 Describe the role of system event logs in data collection.
	91.07 Describe the role of the process log in data collection.

CTE Standards and Benchmarks	
	91.08 Describe the processes associated with preserving evidence collected for forensic purposes.
	91.09 Describe how the chain of custody can be maintained for evidence collected during a forensic analysis effort.
92.0	Demonstrate an understanding of database design, structure, and operation. The student will be able to:
	92.01 Describe a relational database and its key elements.
	92.02 Describe the Entity Relationship Model (ERM) and relate how it is a factor in database security.
	92.03 Describe the process of normalization and explain its role in database security.
	92.04 Differentiate between one-to-many, many-to-many and one-to-one relationships.
	92.05 Define referential integrity and describe its implications on database security.
	92.06 Discuss the role of authentication in database security.
93.0	Demonstrate a fundamental understanding of Structured Query Language (SQL). The student will be able to:
	93.01 List the capabilities of SQL SELECT statements.
	93.02 Execute basic SQL statements, including SELECT, INSERT, and UPDATE.
	93.03 Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
	93.04 Use column aliases to rename columns in the query result.
	93.05 Use SQL to display the structure of a table.
	93.06 Apply SQL syntax to restrict the rows returned from a query.
	93.07 Demonstrate application of the WHERE clause syntax.
	93.08 Apply the proper comparison operator to return a desired result.
	93.09 Create, drop, rename and truncate tables using SQL.
	93.10 Create and remove an index using a SQL statement.
	93.11 Create or modify users and roles using SQL statements.
	93.12 Use the GRANT and REVOKE SQL statements to control access.
	93.13 Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML) SQL statements and discuss their respective implications to database security.
94.0	Demonstrate an understanding of database security policies. The student will be able to:
	94.01 Explain the role of the Database Management System (DBMS) in maintaining database security.

CTE Standards and Benchmarks	
	94.02 Describe three aspects of system level security related to databases (i.e., user privilege schema, user authentication, operating system level privileges).
	94.03 Describe the mechanisms that control access to and use of the database at the object level.
	94.04 Explain how role-based privilege assignment can be used as a data security model.
	94.05 Compare and contrast the implications of connecting to a database with administrator versus user privileges.
95.0	Demonstrate an understanding of database access control, functions, methods, and verification. The student will be able to:
	95.01 Compare and contrast rights and privileges as they relate to database security.
	95.02 Describe the manner in which database user rights and privileges are controlled (e.g., granted, revoked).
	95.03 Describe application access rights and discuss their role in a database security schema.
	95.04 Compare and contrast table, column, and row level security, including VIEW implications.
	95.05 Describe fine-grained access control and its use in database security.
	95.06 Describe the operation of a database firewall and explain its role in a database security schema.
	95.07 Describe how database security policies may be used to trigger security auditing events.
	95.08 Describe the various types of auditing (e.g., statement, privilege, object, fine-grained) and associated records.
96.0	Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures. The student will be able to:
	96.01 Describe the SQL Injection attack vector and explain its potential consequences (e.g., privilege escalation, data compromise, data destruction).
	96.02 Describe database inference as a vulnerability and explain how sensitive information can be compromised inadvertently.
	96.03 Discuss ways in which to prevent or limit database inference at design time and query time.
	96.04 Compare and contrast the various countermeasures and strategies to prevent an SQL injection from being successful.
	96.05 Compare and contrast the ways in which encryption might be applied to a database (i.e., database, fields, records, columns) and discuss the tradeoffs of each.
97.0	Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery. The student will be able to:
	97.01 Describe the criteria which might be employed to trigger an intrusion or breach alarm.
	97.02 Identify the sources for confirming and tracking intrusion.
	97.03 Describe the tools and methodologies used to determine the scope of data compromise.
	97.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
	97.05 Describe the appropriate actions related to database recovery during incidence response.

CTE Standards and Benchmarks	
98.0	Demonstrate an understanding of software design, structure, and operation. The student will be able to:
98.01	Describe a typical software application and its key elements.
98.02	Compare and contrast software quality and software security in terms of development time, testing, and implementation.
98.03	Explain how security can be a software design parameter and discuss the inherent trade-offs during the development life cycle.
98.04	Describe the common failings in software security (e.g., input handling, inadequate testing, incomplete/incorrect algorithms, memory misuse, holes for privilege escalation).
99.0	Demonstrate a fundamental understanding of common software attack vectors. The student will be able to:
99.01	Describe how buffer overflow attacks can be prevented through input validation and proper interpretation.
99.02	Describe a command injection attack, how it can occur, and the potential consequences.
99.03	Describe an SQL injection attack, how it can occur, and the potential consequences.
99.04	Describe a code injection attack, including PHP remote code injection, how it can occur, and the potential consequences.
99.05	Describe cross-site scripting attack, how it can occur, and the potential consequences.
100.0	Demonstrate an understanding input syntax validation. The student will be able to:
100.01	Explain the need for validating input syntax to ensure proper input handling.
100.02	Describe canonicalization and its role in handling alternate encoding schemas.
100.03	Discuss the risks associated with improper handling of signed or unsigned numeric input (e.g., very large data length versus negative number).
101.0	Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code. The student will be able to:
101.01	Explain why any input processing algorithm must correctly handle all problem variants.
101.02	Explain why debug or test code should be removed from all production bound software.
101.03	Describe the need for ensuring that machine instructions correctly implement the intended actions of the high-level language code.
101.04	Describe the concept of a strongly typed programming language and explain its role in correct data interpretation.
101.05	Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).
101.06	Describe the race condition associated with shared memory access, its causes, and potential consequences (e.g., DOS attack causing deadlock).
102.0	Demonstrate an understanding of the role of environment variables in the operation of software applications. The student will be able to:
102.01	Describe how the PATH, IFS, and LD_LIBRARY_PATH environment variables can be exploited.
102.02	Explain how dynamic libraries can be subverted through the use of environment variables and describe the potential consequences

CTE Standards and Benchmarks	
	(e.g., elevated privileges).
	102.03 Describe the principle of “least privilege” relative to the operation of software applications, particularly as it relates to file/directory ownership management.
103.0	Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks. The student will be able to:
	103.01 Describe a Root/Admin program and explain the development and operational benefits of partitioning the program into smaller modules.
	103.02 Identify the sources for confirming and tracking intrusion.
	103.03 Describe the tools and methodologies used to determine the scope of data compromise.
	103.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
	103.05 Describe the appropriate actions related to database recovery during incidence response.
104.0	Demonstrate an understanding of the primary security services used in Internet and intranet environments. The student will be able to:
	104.01 Describe Secure Sockets Layer (SSL) security service.
	104.02 Compare and contrast SSL with Transport Layer Security (TLS) as a security service.
	104.03 Describe Internet Protocol Security (IPsec) and discuss its benefits and three functional areas (i.e., authentication, confidentiality, key management).
	104.04 Describe Secure/Multipurpose Internet Mail Extension (S/MIME) and discuss its role in achieving secure Internet-based communications.
105.0	Demonstrate a fundamental understanding of the SSL protocol stack and its elements. The student will be able to:
	105.01 Compare and contrast SSL Connection and SSL Session.
	105.02 Describe SSL Record Protocol services and discuss their role in managing SSL exchanges (i.e., message integrity, confidentiality).
	105.03 Describe the operation of the SSL Record Protocol, including the key steps that ensure security (e.g., adding message authentication code, encryption).
	105.04 Explain the role of the SSL Change Cipher Spec Protocol in ensuring secure transactions.
	105.05 Explain the role of the SSL Alert Protocol.
	105.06 Describe the SSL Handshake Protocol and explain the role of each phase of communication (i.e., establish security capability, server authentication/key exchange, client authentication/key exchange, complete secure connection).
106.0	Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms. The student will be able to:
	106.01 Compare and contrast IPsec with SSL and TSL.
	106.02 Compare and contrast security services provided under IPv4 and IPv6.
	106.03 Differentiate between the three facilities available under IPsec (i.e., Authentication Header, Encapsulating Security Payload, key exchange).

CTE Standards and Benchmarks	
	106.04 Describe the concept of Security Association (SA) and explain the roles of its three parameters (i.e., Security Parameters Index, IP Destination Address, Security Protocol Identifier).
	106.05 Describe the purpose, structure, and criteria of the Authentication Header (AH).
	106.06 Describe the purpose, structure, and elements of the Encapsulating Security Protocol (ESP).
	106.07 Describe the structure and operation of the key management facility of IPsec.
107.0	Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates. The student will be able to:
	107.01 Describe the role of S/MIME in conducting email communications.
	107.02 Compare and contrast the four new security functions provided by S/MIME (i.e., enveloped data, signed data, clear-signed data, and signed enveloped data).
	107.03 Outline the process of using S/MIME during email processing.
	107.04 Describe the various cryptographic algorithms used by S/MIME and discuss their applicability (i.e., DSS, RSA, SHA-1, MD5, ElGamal, AES, 3DES, HMAC).
	107.05 Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).
	107.06 Describe the need for using x.509 v3 public key certificates with S/MIME.
108.0	Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network. The student will be able to:
	108.01 Compare and contrast the roles and operation of a Kerberos Authentication Server (AS) and a Ticket Granting Server (TGS).
	108.02 Describe a Kerberos realm and the mechanism for inter-realm authentication.
109.0	Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains. The student will be able to:
	109.01 Describe the key components of identity management architecture.
	109.02 Describe the concept of identity federation and explain its benefits.
	109.03 Describe the standards used in federated identity management (i.e., XML, SOAP, WS-Security, SAML).
110.0	Complete a safety skills inventory. The student will be able to:
	110.01 Practice safety procedures while enrolled in this course.
	110.02 Demonstrate an understanding of safety and general policies and procedures.
111.0	Demonstrate acceptable project values. The student will be able to:
	111.01 Maintain a positive relationship with peers.
	111.02 Demonstrate adaptive self-management skills.

	111.03 Adhere to industry accepted, legal, and ethical standards of cyber conduct.
	111.04 Rotate through a wide variety of increasingly responsible experiences.
	111.05 Apply superior skills in communications, mathematics, and science appropriate to technological content and learning activities.
112.0	Demonstrate the ability to detect and resolve system vulnerabilities. The student will be able to:
	112.01 Prepare a vulnerability matrix to identify and record weak points, the type of vulnerability, and significance of the vulnerability, the priority, and the solution.
	112.02 Determine possible solutions for each vulnerability.
	112.03 Research each detected vulnerability.
	112.04 Document solutions as they are devised.
	112.05 Prepare an alternative for any solution that is not successful.
	112.06 Continue the process until a workable solution is found for each vulnerability.
113.0	Plan, organize, and carry out a penetration testing plan. The student will be able to:
	113.01 Determine the scope and attack vectors for the test.
	113.02 Organize the team according to individual strengths.
	113.03 Assign specific tasks within a team.
	113.04 Prioritize the attack vectors and sequence the test.
	113.05 Identify required resources.
	113.06 Carry out the testing plan to successful completion.
	113.07 Create the test report detailing the goals, tests, findings, and results.
114.0	Demonstrate proficiency in conducting forensic analysis. The student will be able to:
	114.01 Create security incident handling and response policies.
	114.02 Recover deleted, encrypted, or damaged file information as evidence for prosecution in computer crimes.
	114.03 Deploy proprietary and/or open source tools to identify intruder footprints.
	114.04 Coordinate incident response activities.
	114.05 Prepare proper documentation of chain of custody, including accounting for evidence source, destination, and possession.
	114.06 Preserve forensic integrity of evidence.
	114.07 Model highest moral and ethical standards in conducting digital forensic investigations.
115.0	Successfully work as a member of a team. The student will be able to:

	115.01 Accept responsibility for specific tasks in a given situation.
	115.02 Document progress, and provide feedback on work accomplished in a timely manner.
	115.03 Complete assigned tasks in a timely and professional manner.
	115.04 Reassign responsibilities when the need arises.
	115.05 Complete daily tasks as assigned on one's own initiative.
116.0	Manage time according to a plan. The student will be able to:
	116.01 Set realistic time frames and schedules.
	116.02 Record time worked in the daily journal.
	116.03 Meet goals and objectives set by the team.
	116.04 Identify individual priorities.
	116.05 Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.
117.0	Keep acceptable records of progress problems and solutions. The student will be able to:
	117.01 Develop a record keeping system in the form of a log book or journal to record daily progress.
	117.02 Use a project journal to identify problem statement.
	117.03 Develop a portfolio of work accomplished to include design drawings, research, drawings and plans, storyboards, models, mock-ups and prototypes.
118.0	Manage resources. The student will be able to:
	118.01 Identify required resources for each stage of the project plan.
	118.02 Determine the methods needed to acquire needed resources.
	118.03 Demonstrate good judgment in the use of resources.
	118.04 Recycle and reuse resources where appropriate.
	118.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
119.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	119.01 Identify the proper tool for a given job.
	119.02 Use tools and machines in a safe manner.
	119.03 Adhere to laboratory or job site safety rules and procedures.
	119.04 Identify the application of processes appropriate to the task at hand.
	119.05 Identify materials appropriate to their application.

120.0	Research content related to the project and document the results. The student will be able to:
120.01	Identify the basic research needed to develop the project plan.
120.02	Identify available resources for completing background research required in the project plan.
120.03	Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources.
120.04	Demonstrate the ability to organize information retrieval.
120.05	Demonstrate the ability to prepare a topic outline.
120.06	Write a draft of the design and testing report.
120.07	Edit and proof the respective report.
120.08	Prepare an electronically composed report in proper form.
121.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
121.01	Prepare a multi-media presentation on the completed project.
121.02	Make an oral presentation, using multi-media materials.
121.03	Review the presentation, and make changes in the delivery method(s) to improve presentation skills.
122.0	Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon. The student will be able to:
122.01	Demonstrate a mastery of the content of the selected subject area.
122.02	Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
122.03	Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.
122.04	Demonstrate the acquisition of additional knowledge, skill and experience in one area of the selected field of study beyond the performance standards of the initial program standards.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodation changes the way the student is instructed. Students with disabilities may need accommodation in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodation requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Fundamentals of Data Science**
Program Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Program Number	9003100
CIP Number	0530700102
Grade Level	6-8
Standard Length	Year
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FL-TSA, SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a course that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in Data Analytics and Data Science-enabled careers; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills required for such data professionals working in business and academic environments. The intention of this course is to prepare students to be successful both personally and professionally in an increasingly data-focused society that demands more thorough data understanding and fluent analytic skills.

The content includes fundamental understanding and application of data science and analytics, including data gathering from the web, thinking critically about data, data visualization, working with spreadsheets and databases, societal impacts and ethical concerns in data science, as well as building models and systems that leverage data to make decisions. In addition, the course content includes but is not limited to practical experiences in problem identification; creation, selection, and curation of data sets; evaluation of the societal impact of data science applications, employing ethical and responsible development methodologies and decision making, essential data processing techniques, and implementation issues.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the program structure:

Course Number	Course Title	Teacher Certification	Length
9003110	Exploring and Applying Data Science	BUS ED 1@2 INFO TECH 7G WEB DEV 7G ENG 7G EG TEC 7G TECH ED 1 @2 ENG & TEC ED 1@2 MATH 6-12 Science 6-12 Any Computer Science	Year

Standards

After successfully completing this course, the student will be able to perform the following:

Exploring Data Science

01.0 Demonstrate proficiency using the Internet to locate information.
02.0 Demonstrate proficiency locating, gathering, and preparing textual, graphical, and image-based web content.
03.0 Demonstrate an understanding of Internet safety and ethics.
04.0 Demonstrate an understanding of computer networks.
05.0 Describe different kinds of data, their sources, and how they might be used in decision making.
06.0 Think critically about data.
07.0 Understand how data is accessed, sorted, and stored.
08.0 Develop and apply fundamental spreadsheet skills.
09.0 Develop and apply database knowledge and skills.

Applying Data Science

10.0 Explain and use design thinking to solve a problem.
11.0 Understand human and organizational behavior in the context of the data science process.
12.0 Demonstrate knowledge of Data Governance (safety and privacy) practices for data use.
13.0 Identify and apply different data collection methods and understand the importance of data quality.
14.0 Generate and tell stories with data.
15.0 Know and apply best practices in data visualization.
16.0 Be aware of the limitations of statistics and cognitive biases in data analysis.
17.0 Critique data and data-based claims to avoid being misled by data.

Florida Department of Education
Student Performance Standards

Course Title: **Exploring and Applying Data Science**
Course Number: **9003110**
Course Credit: **Year**

Course Description:

This course is to instruct students in the best practices in data gathering and processing for data science and analytics. The content includes but is not limited to information searching and retrieval on the Internet, critical understanding of how data is used in society, plus foundational knowledge and skills related to spreadsheets and databases. Moreover, the course covers ethical concerns in data privacy and security. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices. The course provides students with core foundational knowledge of working with data through practices and applications. This course builds an understanding of each stage in the data project pipeline from both the technical and the human behavioral perspectives. The content includes but is not limited to foundational knowledge and skills related to design thinking, data collection, data governance, storytelling with data visualization, and critical data analysis. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
01.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
01.01	Identify and use web terminology (WWW, web browser, Internet, web server, web page, address bar, hyperlinks, navigation buttons, search bar, bookmarks/favorites, tab, downloading, plug-ins, social media plug-ins).
01.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., HTTP, FTP, telnet, mailto).
01.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
01.04	Demonstrate proficiency using search engines, including Boolean search techniques.
01.05	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF).
01.06	Compare and contrast the roles of web servers and web browsers.
01.07	Evaluate online information for relevance, credibility and quality using basic guidelines and indicators (e.g., authority, affiliation, purpose, bias, date).
01.08	Identify and apply copyright and fair use guidelines and explain plagiarism as an ethical and legal violation.
01.09	Incorporate results from Internet searches into a research project (e.g., report, summary).

CTE Standards and Benchmarks	
	01.10 Download images as needed to support a research project, complying with copyright notices.
	01.11 Properly cite Internet sources used to obtain information for a research project.
	01.12 Understand how AI-based applications work, and how they can improve web searches or respond to user requests, e.g., ChatGPT, Bard, Claude, etc.
02.0	Demonstrate proficiency locating, gathering, and preparing textual, graphical, and image-based web content. The student will be able to:
	02.01 Define the elements of a webpage and what makes a good webpage.
	02.02 Describe effective text and image content for webpages based on how visitors use the web.
	02.03 List guidelines and conventions for effective text on webpage.
	02.04 Explain the inverted pyramid model of newspaper journalism and how it applies to web content.
	02.05 Use word-processing software to create effective written content for a webpage.
	02.06 Create and/or edit message-driven image content for a webpage using graphics software.
	02.07 Access graphics through various resources (e.g., scanner, digital camera, CD-ROM, clipart, copyright-free online graphics).
	02.08 Plan the content and design of a basic webpage using strategies for effective web communication, including brainstorming, determining audience, choosing content and media types, using white space.
	02.09 Explore prompt engineering with AI-based image generators, e.g., Dall-E 2, Midjourney, etc., see how prompt changes result in different output images.
03.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:
	03.01 Describe risks associated with social networking sites (e.g., Facebook, Snapchat, Instagram, Twitter) and ways to reduce these risks.
	03.02 Define “privacy” and relate it to the term “digital footprint”.
	03.03 Practice cyber-safety techniques to protect your personal information when using Internet searches, email, chat rooms, and social network websites.
	03.04 Describe cyberbullying, its impact on perpetrators and victims and ways to respond.
	03.05 Describe risks associated with sexting (including legal issues, social consequences), and discuss methods for response, reporting, and prevention.
	03.06 Describe risks associated with online gaming and identify ways to reduce these risks.
	03.07 Discuss issues related to downloading music or videos from the Internet, including unethical vs. illegal actions.

CTE Standards and Benchmarks	
03.08	Compare and contrast rules for copyright and fair use, especially in relation to using online resources for school and educational purposes.
03.09	Distinguish between viruses and malware and discuss their impact on personal privacy and computer operation.
03.10	Describe common threats used to spread malware and viruses, including phishing, pharming, Trojans, spyware, malicious sites, “free” downloads.
03.11	Perform an antivirus scan on a computer system to check for viruses and malware.
03.12	Describe strong password practices.
03.13	Practice cyber safety techniques to protect your computer system when using Internet searches, email and social network websites.
03.14	Identify security issues related to mobile phones, including personal information compromised if a phone is lost or stolen.
03.15	Adhere to Acceptable Use Policies when accessing the Internet.
04.0	Demonstrate an understanding of computer networks. The student will be able to:
04.01	Define “network” and give examples of networks used at home, school, and work.
04.02	Compare types of networks, including LAN, WAN, MAN, VPN, intranet, extranet, the Internet.
04.03	Compare common network topologies, including bus, star, ring, mesh.
04.04	Compare various network models and their advantages, including client/server, mainframe/terminal, peer-to-peer.
04.05	Compare various methods and media for network connections, including broadband, wireless, Bluetooth, cellular, satellite.
04.06	Describe the functions of various network hardware devices, including NIC, hub, switch, router, bridge, gateway, access point.
04.07	Describe protocols' purpose and identify protocols commonly used in networks, including: TCP/IP, DHCP, DNS, HTTP, FTP, IMAP, POP, SMTP.
04.08	Describe the purpose and function of IP addressing and distinguish between public and private IP addresses.
04.09	Describe the OSI reference model and its layers, including tracing the flow of data between two network nodes through the OSI layers.
05.0	Describe different kinds of data, their sources, and how they might be used in decision making. The student will be able to:
05.01	Identify the different kinds of data we collect and share as Internet users.
05.02	Define numeric, text, date, graphics and sound types of data that computers use.

CTE Standards and Benchmarks	
	05.03 Distinguish that data requires context to be information.
	05.04 Describe how computers store data using bits (binary digits).
	05.05 Describe and construct a simple model of the data processing cycle (input-processing-output).
	05.06 Explain why data is the fuel of machine learning and the importance of quality data for gaining insights.
	05.07 Identify and describe sources of company data such as basic information, economic information, technology information (e.g., website traffic and search trends), and reviews-based information (e.g., business ratings and reviews).
	05.08 Identify and describe sources of people data such as Internet behavior: web presence score, social networks and social mentions, search engine results, proxy usage, interests, and purchasing behavior.
	05.09 Identify and describe sources of geospatial data such as location-specific alternative data such as demographic information, property information, purchasing behavior, and other business information.
	05.10 Identify and describe sources of time-based data such as real-time information surrounding events, politics, and Internet trends behavior (e.g., trending keywords and subjects, foot traffic, web traffic).
	05.11 Explain how different kinds of data can be used in decision-making and the form of data (e.g., text, numerical, time series, or image) that may be represented in.
06.0	Think critically about data. The student will be able to:
	06.01 Understand and explain how data changes over time, e.g., weather through seasons.
	06.02 Analyze information and come up with conclusions based on the data presented.
	06.03 Show ability to interpret and make predictions based on data that changes over time.
	06.04 Interpret data representations accurately and describe meaningful patterns within the data.
	06.05 Identify potential bias and missing data; accurately connect position statements with datasets that support them.
	06.06 Separate fact-based information from opinion-based inferences.
	06.07 Make quantitative and qualitative comparisons of data.
	06.08 Use appropriate mathematical/ statistical methods to develop and/or support claims that address specific scientific questions.
07.0	Understand how data is accessed, sorted, and stored. The student will be able to:
	07.01 Explain the role that computers play in storing and accessing data.
	07.02 Explain how computing devices represent and manipulate information.

CTE Standards and Benchmarks	
07.03	Identify and understand the roles of databases in everyday life.
07.04	Describe different kinds of databases (e.g., SQL, NoSQL, graph DBs) and how they organize and transform different kinds of data (e.g., tabular, knowledge graphs).
07.05	Understand datasets with multiple categories/arranged in scaled graphs.
07.06	Understand and show ability to represent and manipulate data.
08.0	Develop and apply fundamental spreadsheet skills. The student will be able to:
08.01	Define a “spreadsheet” and describe ways it may be used.
08.02	Identify the parts of the spreadsheet display, including cells, columns and rows, cell references, cell range.
08.03	Create and navigate through multiple spreadsheets in a file.
08.04	Insert and format various types of data (text, numeric, date/time) in a spreadsheet cell.
08.05	Select multiple cells, including adjacent and non-adjacent ranges, using mouse and keyboard techniques.
08.06	Cut, copy, and paste information from one or more cells to another part of the spreadsheet.
08.07	Use the undo and redo tools in a spreadsheet.
08.08	Apply and modify cell formatting for currency, date and percentage values.
08.09	Resize column width and row height in a spreadsheet.
08.10	Insert and delete columns and rows in a spreadsheet.
08.11	Merge and unmerge cells in a spreadsheet.
08.12	Apply shading and borders to a spreadsheet.
08.13	Describe the purpose of a table and how it relates to a spreadsheet.
08.14	Create and print a table and/or range that displays, sums, and averages the values of numeric data types.
08.15	Identify various types of charts (e.g., line, bar, pie, scatter) and common chart components (e.g., vertical axis, horizontal axis, legend), and explain when to use each chart type.
08.16	Create a chart from existing data and format the pieces (data set), change the background color, and add appropriate titles and a legend.
08.17	Insert common functions (SUM, AVERAGE, COUNT, MAX, MIN) and simple mathematical formulas which include addition,

CTE Standards and Benchmarks	
	subtraction, multiplication, or division into a spreadsheet.
08.18	Distinguish between absolute and relative cell references in a spreadsheet.
08.19	Use the SORT function to organize information numerically or alphabetically, including multiple levels of sorting.
08.20	Use the FILTER function to display spreadsheet data based on specific criteria.
08.21	Use the PERCENTILE, MEDIAN, and MODE functions to understand data distributions better.
08.22	Use conditional formatting to highlight text in a spreadsheet.
08.23	Describe what a pivot table is and apply it to categorical data.
08.24	Apply custom functions to tabular data, e.g., linear fit.
09.0	Develop and apply database knowledge and skills. The student will be able to:
09.01	Define what a database is and describe real-world uses (e.g., student info, search engines, social media user data, etc.).
09.02	Identify the components of a database.
09.03	Distinguish between databases and spreadsheets.
09.04	Identify advantages of using a database instead of alternatives (e.g., spreadsheets, electronic documents, paper).
09.05	Define “Big Data” and describe how it is used in advertising.
09.06	Distinguish between fields and records in a database.
09.07	Describe the basic data types and formats used in a database.
09.08	Distinguish between a table and a query.
09.09	Describe Structured Query Language (SQL) and discuss its use with databases.
10.0	Explain and use design thinking to solve a problem. The student will be able to:
10.01	Distinguish between social and personal problems to be solved through a design.
10.02	Identify a challenge of social importance and personal interest.
10.03	Develop problem statements embedded within a complex challenge.
10.04	Understand challenges and user needs more deeply.

CTE Standards and Benchmarks	
	10.05 Pattern and sort user data to define design challenges.
	10.06 Use a formal brainstorming process to generate ideas.
	10.07 Test and iterate prototypes.
	10.08 Refine prototypes based on user feedback.
	10.09 Create stakeholder maps.
	10.10 Develop point-of-view statements for users.
	10.11 Develop a blueprint for a prototype.
	10.12 Gather feedback from users.
	10.13 Revise prototypes and present rationale for final design.
11.0	Understand human and organizational behavior in the context of the data science process. The student will be able to:
	11.01 Identify the main stakeholders (personas) in a data analysis/ data science project, describe their roles and motivating factors (e.g. Data Scientist “free data” vs. DevOps "data security first”).
	11.02 Not treat new technology (e.g., AI) either as the “worst thing ever” or “best thing ever”: Realize the existence and ramifications of opposing desires, (1) need for control/ preference for status quo/ fear of the unknown, vs. (2) fear of missing out on the next great technical breakthrough/ hype.
	11.03 Recognize and apply learning theories, e.g., the impact of cognitive overload, zone of proximal development, etc. Understand the roadblocks in communicating new concepts to stakeholders and/or convincing them to adopt new data-related practices.
	11.04 Describe what Dunning-Kruger Effect and Imposter Syndrome are and understand how they affect stakeholders in a data science project.
12.0	Demonstrate knowledge of data governance (safety and privacy) practices for data use. The student will be able to:
	12.01 Understand that different datasets have different ownership structures and describe them.
	12.02 Recognize the significance and motivations of various data owning entities, e.g., government, commercial, education, non-profit, personal.
	12.03 Identify ways that data can be encrypted in storage and transit.
	12.04 Name different data anonymization methods and know how they can be applied to different types of data.
	12.05 Realize the importance of forming data access groups, how to implement them and ensure they are functioning.

CTE Standards and Benchmarks	
13.0	Identify and apply different data collection methods and understand the importance of data quality. The student will be able to:
13.01	Name different ways that data can be collected and their use cases: sensors (in fitness devices, cars, drones), Internet usage (cookies), online/offline surveys, etc.
13.02	Document relevant information (metadata) about the collected data: e.g., 5W's and how it was collected, what each data field or column title means, what data format should each contain, how often the data might be updated and by what methods.
13.03	Describe different ways that data could be erroneous (e.g., data type errors, misspelling) and data collection practices that might result in bad or missing data (e.g., undocumented manual data entry).
13.04	Identify methods to correct bad or missing data and their pros vs. cons (e.g., omit, interpolate, impute).
13.05	Practice implementing corrective methods for improving data quality.
13.06	Recognize the importance of and develop protocol for monitoring data quality.
14.0	Generate and tell stories with data. The student will be able to:
14.01	Describe the information various online datasets provide and identify the types of questions they can and cannot answer.
14.02	Decode data: Identify and extract measurements, values or data points and what they represent from graphs, tables, or other data representations.
14.03	Identify structural components of data representations (e.g., axes on a graph, table rows and columns, scale on a geographic map, key on a color map, etc.)
14.04	Collect, organize, proofread, and manipulate data with spreadsheet functions.
14.05	Apply statistics to find patterns in data.
14.06	Use spreadsheet functions to create tables and graphs to visually represent and communicate findings.
14.07	Construct informed summaries, decisions, and predictions related to the data.
14.08	Tell a data story using appropriate visualizations that are clear, compelling and accessible for the audience (e.g., infographics, charts, graphs, etc.).
15.0	Know and apply best practices in data visualization. The student will be able to:
15.01	Realize that the human brain combines visual cues and form immediate conclusions.
15.02	Give examples of "simple" vs. "complex" charts and identify situations where they work best.
15.03	Consider the audience and goals of the data visuals and make appropriate design decisions.
15.04	Decide whether or how to shape the data before constructing the graphs.

CTE Standards and Benchmarks	
	15.05 Determine which chart types to use and make appropriate design decisions.
	15.06 Apply and shape visual elements to convey desired messages, e.g., color, size, placement, etc.
	15.07 Make sure that chart elements e.g. axes, labels, titles, are accurate and don't mislead the readers.
	15.08 Define "chart junk" and know how to minimize it.
	15.09 Realize that stories and narratives often make data conclusions more compelling.
	15.10 Construct a logical presentation flow in presenting findings from data analysis.
	15.11 Apply appropriate design choices for presentation slides and other elements.
	15.12 Present data in an appropriate and compelling way for the audience.
16.0	Be aware of the limitations of statistics and cognitive biases in data analysis. The student will be able to:
	16.01 Identify and understand what the Anscomb's Quartet illustrates about the limitation of summary statistics.
	16.02 Recognize and understand how sampling bias can occur.
	16.03 Define and give examples of cognitive biases, e.g., survivorship bias, confirmation bias, anchoring, availability, endowment effect, correlation vs. causation, etc.
17.0	Critique data and data-based claims to avoid being misled by data. The student will be able to:
	17.01 Provide examples of the social and personal consequences of predictions based on models built on data.
	17.02 Distinguish between credible vs. unreliable/biased information sources.
	17.03 Recognize and describe signs of compromised information or data.
	17.04 Identify and describe errors in decisions and predictions due to faulty use of data (e.g., confounding, random errors).
	17.05 Describe issues of privacy and security with respect to data collection, storage, analysis, and insights.
	17.06 Discuss how and when data can support making decisions.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Applied Information Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9003400
CIP Number	0511010316
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to computer application skills including computer hardware, software applications, applications, computer programming, webpage design and advanced web tools, systems support and maintenance, network concepts, relational database concepts, multimedia tools, cybersecurity; extensive exploration of information technology careers; strategies for success including goal setting, study skills, organizing skills, learning styles, employability skills, and service learning; and core academic skills with a strong emphasis on effective communication skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits. To complete this program, students must complete Computer Fundamentals, Web Technologies, IT Systems & Applications, and at least one additional course listed. The Digital Business Foundations course may be used as a substitute for Computer Fundamentals (9001310) in this program.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1 Options	8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
	9003410	Computer Fundamentals	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G	1 credit	15-1151	2	CT
Course 2	9003420	Web Technologies		1 credit	15-1151	3	CT
Course 3	9003430	IT Systems & Applications		1 credit	15-1151	3	CT
	And one or more of the following courses:						
Course 4 Options	9003440	Database Essentials		1 credit	15-1151	3	CT
	9003450	Programming Essentials		1 credit	15-1151	3	CT
	9003460	Web Development Technologies		1 credit	15-1151	3	CT
	9003470	Multimedia Technologies		1 credit	15-1151	3	CT
	9003480	Computer Networking Fundamentals		1 credit	15-1151	3	CT
	9003490*	Cybersecurity Fundamentals		1 credit	15-1151	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

* Students should have a strong networking knowledge base prior to enrolling in this course. The Computer Networking Fundamentals course (9003480) is recommended to provide this knowledge base.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.

OR

Computer Fundamentals

10.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance.
11.0 Practice quality performance.
12.0 Demonstrate knowledge of different operating systems.
13.0 Develop a familiarity with the information technology industry.
14.0 Develop an awareness of microprocessors and digital computers.
15.0 Develop an awareness of programming languages.
16.0 Develop an awareness of emerging technologies.
17.0 Demonstrate an understanding of the seven layers of the Open Systems Interface (OSI) model.
18.0 Demonstrate an awareness of specialized software.
19.0 Identify computer components and their functions.
20.0 Demonstrate proficiency using the Internet to locate information.
21.0 Demonstrate proficiency using common software applications.
22.0 Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/ employee roles.
23.0 Perform e-mail activities.
24.0 Demonstrate proficiency in using presentation software and equipment.
25.0 Perform decision-making activities in a multimedia environment.
26.0 Demonstrate language arts knowledge and skills.
27.0 Demonstrate mathematics knowledge and skills.
28.0 Demonstrate science knowledge and skills.
29.0 Demonstrate an understanding of the implications of storing sensitive information.

AND

Web Technologies

30.0 Demonstrate proficiency on the principles of design.
31.0 Demonstrate proficiency planning an effective website.
32.0 Demonstrate proficiency using web development tools and techniques.
33.0 Demonstrate proficiency using specialized web design software.
34.0 Demonstrate proficiency gathering, preparing and evaluating web content.
35.0 Demonstrate an awareness of preparing a website for launch.
36.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
37.0 Solve problems using critical thinking skills, creativity and innovation.

AND

IT Systems & Applications

38.0 Explain motherboard components, types and features.
39.0 Explain the purpose and characteristics of CPUs and their features.
40.0 Perform installation and configuration activities.
41.0 Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact.
42.0 Demonstrate knowledge of presentation production issues.
43.0 Demonstrate proficiency using computer networks.
44.0 Demonstrate proficiency communicating over the Internet.
45.0 Demonstrate proficiency in troubleshooting, repair and maintenance of hardware.
46.0 Demonstrate proficiency in the basic principles of security concepts and technologies.
47.0 Demonstrate proficiency in operational procedures as they relate to computer equipment and components.
48.0 Use information technology tools.
49.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
50.0 Describe the importance of professional ethics and legal responsibilities.

AND ONE OR MORE OF THE FOLLOWING COURSES:

Database Essentials

51.0 Develop the "big picture" of database design and how best to organize data according to business rules and/or client needs.
52.0 Develop the process of creating an entity by identifying relationships.
53.0 Formulate and assemble initial entity relationship by expanding on modeling concepts.
54.0 Consider the degree and optionality of relationships of entities.
55.0 Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams.

56.0 Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships.
57.0 Apply the complex ERM information by fine-tuning entities and the process for relating them.
58.0 Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved.
59.0 Manipulate data.
60.0 Building and modifying tables.
61.0 Performing queries and filtering records.
62.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
63.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
64.0 Explain the importance of employability skill and entrepreneurship skills.
65.0 Demonstrate personal money-management concepts, procedures, and strategies.

Programming Essentials
66.0 Plan program design.
67.0 Code programs.
68.0 Test programs.
69.0 Perform program maintenance.
70.0 Create and maintain documentation.
71.0 Develop an awareness of software quality assurance.
72.0 Develop an understanding of programming techniques and concepts.
73.0 Design structured programs.

Web Development Technologies
74.0 Demonstrate proficiency in page design applicable to the WWW.
75.0 Demonstrate proficiency in webpage design applicable to the WWW.
76.0 Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design.
77.0 Demonstrate proficiency in using digital photography and digital imaging.
78.0 Design and create webpages suitable for publishing to the Internet.
79.0 Describe how website performance is monitored and analyzed.
80.0 Demonstrate proficiency in hosting a website.
81.0 Demonstrate the ability to attract and track traffic for a website.

Multimedia Technologies
82.0 Demonstrate knowledge of presentation production issues.
83.0 Demonstrate proficiency in using digital photography and digital imaging.
84.0 Demonstrate basic video production.
85.0 Demonstrate set-up and configuration of a computer for video applications.
86.0 Demonstrate the basic operation of a video workstation.
87.0 Demonstrate basic audio production.
88.0 Set-up and configure a computer for audio applications.

89.0 Operate an audio workstation.
90.0 Demonstrate proficiency in using presentation software and equipment.

Computer Networking Fundamentals
91.0 Demonstrate understanding of network technologies.
92.0 Understand, install, and configure network hardware.
93.0 Understand, install and configure networking devices.
94.0 Understand, install and configure network management software.
95.0 Understand, install and configure networking tools.
96.0 Install, configure, and manage network security hardware and software devices.

Cybersecurity Fundamentals
97.0 Demonstrate an understanding of cybersecurity, the terminology used, its history and culture, and trends.
98.0 Recognize the following types of malicious code and specify the appropriate actions to take to mitigate vulnerability and risk.
99.0 Recognize and be able to differentiate and explain the following access control models.
100.0 Compare and contrast methods of authentication.
101.0 Recognize the following attacks and specify the appropriate actions to take to mitigate vulnerability and risk.
102.0 Demonstrate an understanding of the processes and risks associated with the following security concerns and tasks.
103.0 Demonstrate an understanding of the administration of the following types of remote access technologies.
104.0 Demonstrate an understanding of the administration of the following email security concepts.
105.0 Demonstrate an understanding of the administration of the following Internet security concepts.
106.0 Demonstrate an understanding of the administration of the following vulnerabilities.
107.0 Demonstrate an understanding of the administration of the following directory security concepts.
108.0 Demonstrate an understanding of the administration of the following file transfer protocols and concepts.
109.0 Demonstrate an understanding of the administration of the following wireless technologies and concepts.
110.0 Compare and contrast the following types of intrusion detection in terms of implementation and configuration.
111.0 Be able to identify the following different kinds of cryptographic algorithms.
112.0 Understand how cryptography and digital signatures address the following security concepts.
113.0 Understand the following concepts of PKI (Public Key Infrastructure).
114.0 Understand the following concepts of Key Management and Certificate Lifecycles.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Computer Fundamentals**
Course Number: **9003410**
Course Credit: **1**

Course Description:

This course introduces students to the essential concepts, components, terminology, and knowledge about computers, computer systems, peripherals, and networks.

CTE Standards and Benchmarks	
10.0	Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. The student will be able to:
10.01	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
10.02	Identify and describe communications and networking systems used in workplace environments.
10.03	Locate and apply reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software.
10.04	Troubleshoot problems with computer hardware peripherals and other office equipment.
10.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
10.06	Demonstrate proficiency in using the basic features of GUI browsers.
11.0	Practice quality performance. The student will be able to:
11.01	Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills).
11.02	Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management).
12.0	Demonstrate knowledge of different operating systems. The student will be able to:
12.01	Identify operating system file naming conventions.
12.02	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
12.03	Demonstrate a working knowledge of standard file formats.
12.04	Differentiate between different operating systems and applications.
12.05	Compare and contrast open source and proprietary software.
12.06	Display understanding of how system utilities help maintain a computer.

CTE Standards and Benchmarks	
13.0	Develop a familiarity with the information technology industry. The student will be able to:
13.01	Explain how information technology impacts the operation and management of business and society.
13.02	Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile).
13.03	Describe how digital technologies (social media) are changing both work and personal lifestyles.
14.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
14.01	Explain software hierarchy and its impact on microprocessors.
14.02	Explain the need for and use of peripherals.
14.03	Demonstrate proficiency installing and using plug-and-play peripherals.
14.04	Identify the basic concepts of computer maintenance and upgrades.
15.0	Develop an awareness of programming languages. The student will be able to:
15.01	Compare and contrast the various categories of programming languages how they evolved and how they are used (e.g., Assembler, Java, JavaScript and SQL).
15.02	Explain the need for and use of compilers.
15.03	Identify the three types of programming design approaches (e.g., top-down, structured, object-oriented).
15.04	Differentiate among source code, machine code, interpreters, and compilers.
15.05	Characterize the major categories of programming languages and how they are used.
15.06	Create a model flowchart for a computer program.
15.07	Create a simple computer application program using JavaScript and HTML.
15.08	Describe the stages in the software development life cycle and explain how to successfully implement them.
16.0	Develop an awareness of emerging technologies. The student will be able to:
16.01	Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer).
16.02	Adhere to published best practices for protecting personal identifiable information when using the Internet.
16.03	Identify trends related to the use of information technology in people’s personal and professional lives.
16.04	Characterize how the rapid pace of change in information technology impacts our society.
17.0	Demonstrate an understanding of the seven layers of the Open Systems Interface (OSI) model. The student will be able to:
17.01	Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.

CTE Standards and Benchmarks	
	17.02 Describe the purpose of the OSI model and each of its layers.
	17.03 Explain specific functions belonging to each OSI model layer.
	17.04 Understand how two network nodes communicate through the OSI model.
	17.05 Discuss the structure and purpose of data packets and frames.
	17.06 Describe the two types of addressing covered by the OSI model.
18.0	Demonstrate an awareness of specialized software. The student will be able to:
	18.01 Compare and contrast the appropriate use of specialized software (e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management).
	18.02 Research and report on the current state of specialized software (e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management).
	18.03 Describe the hardware implications of using specialized software (e.g., RAM, hard drive size, CPU, storage devices).
19.0	Identify computer components and their functions. The student will be able to:
	19.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	19.02 Identify generic computer and programming terminology.
20.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
	20.01 Identify and describe web terminology.
	20.02 Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).
	20.03 Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	20.04 Describe and observe Internet/Intranet ethics and copyright laws and regulatory control.
	20.05 Demonstrate proficiency using search engines, including Boolean search strategies.
	20.06 Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF).
	20.07 Compare and contrast the roles of web servers and web browsers.
21.0	Demonstrate proficiency using common software applications. The student will be able to:
	21.01 Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
	21.02 Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
22.0	Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/employee roles. The student will be able to:

CTE Standards and Benchmarks	
	22.01 Explore, design, implement, and evaluate organizational structures and cultures.
	22.02 Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace.
	22.03 Collaborate with individuals and teams to complete tasks and solve business related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member.
23.0	Perform e-mail activities. The student will be able to:
	23.01 Describe e-mail capabilities and functions.
	23.02 Identify components of an e-mail message.
	23.03 Identify the components of an e-mail address.
	23.04 Identify when to use different e-mail options.
	23.05 Attach a file to an e-mail message.
	23.06 Forward an e-mail message.
	23.07 Use an address book.
	23.08 Reply to an e-mail message.
	23.09 Use the Internet to perform e-mail activities.
	23.10 Identify the appropriate use of e-mail and demonstrate related e-mail etiquette.
	23.11 Identify when to include information from an original e-mail message in a response.
	23.12 Identify common problems associated with widespread use of e-mail.
24.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
	24.01 Produce a presentation that includes music, animation, and digital photography and present it using appropriate technologies.
	24.02 Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
	24.03 Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g. project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers).
	24.04 Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
	24.05 Create a self-running presentation with synchronized audio, convert presentation slides (e.g. PowerPoint) into streaming ASF files for use on the web.
25.0	Perform decision-making activities in a multimedia environment. The student will be able to:
	25.01 Determine work priorities, the audience, project budgets, project specifications, and the production schedule.

CTE Standards and Benchmarks	
	25.02 Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks.
	25.03 Present and defend design projects.
26.0	Demonstrate language arts knowledge and skills. The student will be able to:
	26.01 Locate, comprehend and evaluate key elements of oral and written information.
	26.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
	26.03 Present information formally and informally for specific purposes and audiences.
27.0	Demonstrate mathematics knowledge and skills. The student will be able to:
	27.01 Demonstrate knowledge of arithmetic operations.
	27.02 Analyze and apply data and measurements to solve problems and interpret documents.
	27.03 Construct charts/tables/graphs using functions and data.
28.0	Demonstrate science knowledge and skills. The student will be able to:
	28.01 Discuss the role of creativity in constructing scientific questions, methods and explanations.
	28.02 Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.
29.0	Demonstrate an understanding of the implications of storing sensitive information. The student will be able to:
	29.01 Understand what data should be encrypted.
	29.02 Explain HIPAA.
	29.03 List password security vulnerabilities.
	29.04 Compare and contrast the levels of data classification. (e.g., restricted, confidential/private, public).
	29.05 Discuss cloud vulnerabilities.

Florida Department of Education
Student Performance Standards

Course Title: **Web Technologies**
Course Number: **9003420**
Course Credit: **1**

CTE Standards and Benchmarks	
30.0	Demonstrate proficiency on the principles of design. The student will be able to:
30.01	Identify industry best practices in visual design (e.g., color schemes, fonts, navigation methods, pagination).
30.02	Explain the key concepts of meeting client needs.
30.03	Apply the principles of Human Computer Interface (HCI) to design and develop an effective look and feel for a website.
30.04	Design and create a webpage for optimal display in multiple browsers.
31.0	Demonstrate proficiency planning an effective website. The student will be able to:
31.01	Compare and contrast site maps and wireframes.
31.02	Develop an effective site map for a website.
31.03	Create page layout wireframes for a website.
31.04	Classify web development tasks according to when they are performed during the web development cycle.
31.05	Describe the different types of business requirements that apply to website design.
31.06	Design business requirements to help ensure success for a specific website.
31.07	Demonstrate ability to use effective designer-client communication skills.
32.0	Demonstrate proficiency using web development tools and techniques. The student will be able to:
32.01	Compare and contrast writing HTML using a text editor versus using a WYSIWYG editor.
32.02	Design and create an effective webpage template.
32.03	Create attractive, engaging, and efficient webpages using a WYSIWYG editor.
32.04	Create an appropriate directory structure, naming convention protocol, and file organization for a website.
32.05	Create DHTML and XML documents using editors or converters.
33.0	Demonstrate proficiency using specialized web design software. The student will be able to:
33.01	Compare and contrast various specialized web design software (e.g., Photoshop, Dreamweaver).
33.02	Demonstrate proficiency using various specialized web design software (e.g., Photoshop, Dreamweaver).

CTE Standards and Benchmarks	
34.0	Demonstrate proficiency gathering, preparing and evaluating web content. The student will be able to:
34.01	Characterize effective writing styles and conventions for the web.
34.02	Create effective written content for the web.
34.03	Prepare various types of graphical content for use on a webpage.
34.04	Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD-ROMs).
34.05	Create and edit images using image or graphic design software.
34.06	Compare and contrast static versus dynamic web content.
34.07	Evaluate sources for accuracy of content.
35.0	Demonstrate an awareness of preparing a website for launch. The student will be able to:
35.01	Evaluate a website for basic usability and accessibility issues.
35.02	List the steps that are necessary to determine when a website is ready to launch.
35.03	Develop a User Testing Plan.
35.04	Demonstrate the ability to organize and execute a user testing of a website in multiple browsers.
36.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
36.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
36.02	Locate, organize and reference written information from various sources.
36.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
36.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.
36.05	Apply active listening skills to obtain and clarify information.
36.06	Develop and interpret tables and charts to support written and oral communications.
36.07	Exhibit public relations skills that aid in achieving customer satisfaction.
37.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
37.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
37.02	Employ critical thinking and interpersonal skills to resolve conflicts.
37.03	Identify and document workplace performance goals and monitor progress toward those goals.
37.04	Conduct technical research to gather information necessary for decision-making.

Florida Department of Education
Student Performance Standards

Course Title: **IT Systems and Applications**
Course Number: **9003430**
Course Credit: **1**

CTE Standards and Benchmarks	
38.0	Explain motherboard components, types and features. The student will be able to:
38.01	Identify different motherboard form factors (ATX/BTX and micro ATX).
38.02	Identify input/output interfaces (e.g. USB, serial and NIC).
38.03	Identify the different types of bus slots (e.g. PCI, AGP, PCMCIA).
38.04	Identify the BIOS/CMOS/Firmware (e.g. POST, CMOS battery).
39.0	Explain the purpose and characteristics of CPUs and their features. The student will be able to:
39.01	Identify types of CPUs (e.g., AMD Intel).
39.02	Define hyper threading.
39.03	Explain multi core (e.g. dual, triple, quad).
39.04	Explain the difference between onboard cache (e.g. L1, L2, L3).
39.05	Compare and contrast between real and actual speed.
39.06	Compare and contrast between 32 bit and 64 bit processing.
40.0	Perform installation and configuration activities. The student will be able to:
40.01	Install and configure software including device drivers.
40.02	Install and configure operating system software.
40.03	Install and configure application software.
40.04	Install and configure peripherals including device drivers (e.g., scanners, cameras, printers).
40.05	Supervise the testing of operating system management systems (e.g., registry, INI files).
40.06	Prepare the hard disk and related issues for operating system installation (e.g., BIOS, disk controllers).
40.07	Format and partition the hard disk.
40.08	Verify the proper operation of the system (e.g., physical inspection, tests, utilities).
40.09	Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management).

CTE Standards and Benchmarks	
	40.10 Demonstrate proficiency using various memory technologies (e.g., RAM, ROM, virtual memory, memory management).
	40.11 Demonstrate proper use of user interfaces, command utilities, and troubleshooting utilities.
	40.12 Explain the basics of boot sequences, methods and startup utilities.
41.0	Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact. The student will be able to:
	41.01 Identify, troubleshoot and propose solutions for configuration problems.
	41.02 Identify, troubleshoot and propose solutions for software problems.
	41.03 Identify, troubleshoot and propose solutions for hardware malfunctions.
	41.04 Identify, troubleshoot and propose solutions for network malfunctions.
	41.05 Plan and implement a system upgrade and downgrade.
	41.06 Evaluate data recovery using various techniques (e.g., MBR repair tools, rescue disks, disk image, backup).
	41.07 Organize and perform system maintenance activities (e.g., management console, SNMP, system monitors, diagnostics, virus management).
	41.08 Demonstrate corporate interaction proficiency (e.g., responsibility, interaction, communication).
42.0	Demonstrate knowledge of presentation production issues. The student will be able to:
	42.01 Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedure.
	42.02 Demonstrate an understanding of graphic and other file formats (e.g., EPS, TIFF, JPEG, PNG, ASCII, MPEG, MIDI, AVI, WAV) and knowledge of image size when scanning and saving files for use in different presentation types (web, computer, print).
	42.03 Identify display device connectors and types.
	42.04 Define refresh rate, resolution, multi-monitor and Degauss.
	42.05 Demonstrate knowledge of presentation vocabulary/terms.
	42.06 Compare and contrast and utilize various audio/video output solutions and devices (e.g., network, web).
	42.07 Compare and contrast removable storage.
43.0	Demonstrate proficiency using computer networks. The student will be able to:
	43.01 Define networking and describe the purpose of a network.
	43.02 Describe the conceptual background of digital networks including terminology and basics.
	43.03 Describe various types of networks and the advantages and disadvantages of each.
	43.04 Describe the use, advantages, and disadvantages of various network media.

CTE Standards and Benchmarks	
	43.05 Describe the function of various network devices.
	43.06 Describe the difference between the internet and intranet.
	43.07 Compare and contrast IP Version 6 and IP Version 4.
	43.08 Compare and contrast the different network types.
	43.09 Compare and contrast various implementation models.
44.0	Demonstrate proficiency communicating over the Internet. The student will be able to:
	44.01 Display understanding of how Internet Service Providers (ISP) operates and what role they play in enabling users to connect to the Internet.
	44.02 Explain how the Internet works and how documents are connected and transferred.
	44.03 Configure an email client for SMTP and POP3 servers, including port assignment.
	44.04 Explain how the primary modes of Internet communication are used.
45.0	Demonstrate proficiency in troubleshooting, repair and maintenance of hardware. The student will be able to:
	45.01 Determine the troubleshooting methods and tools for peripheral devices.
	45.02 Explain and interpret common device issues and basic troubleshooting methods.
	45.03 Integrate common preventative maintenance techniques.
46.0	Demonstrate proficiency in the basic principles of security concepts and technologies. The student will be able to:
	46.01 Evaluate encryption technologies, software firewall, authentication technologies, and data security.
	46.02 Summarize the following security features (e.g., encryption, malicious software protection, BIOS security, password management and biometrics).
47.0	Demonstrate proficiency in operational procedures as they relate to computer equipment and components. The student will be able to:
	47.01 Compare and contrast ESD, EMI, RFI, and electrical safety.
	47.02 Demonstrate proficiency in the use of state regulations for hazardous materials.
48.0	Use information technology tools. The student will be able to:
	48.01 Use personal information management (PIM) applications to increase workplace efficiency.
	48.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	48.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	48.04 Employ collaborative/groupware applications to facilitate group work.

CTE Standards and Benchmarks	
49.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
49.01	Describe the nature and types of business organizations.
49.02	Explain the effect of key organizational systems on performance and quality.
49.03	List and describe quality control systems and/or practices common to the workplace.
49.04	Explain the impact of the global economy on business organizations.
50.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
50.01	Evaluate and justify decisions based on ethical reasoning.
50.02	Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
50.03	Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace or on social media.
50.04	Interpret and explain written organizational policies and procedures.

Florida Department of Education
Student Performance Standards

Course Title: **Database Essentials**
Course Number: **9003440**
Course Credit: **1**

CTE Standards and Benchmarks	
51.0	Develop the "big picture" of database design and how best to organize data according to business rules and/or client needs. The student will be able to:
51.01	Identify and analyze the phases of the database development process.
51.02	Explain what conceptual data modeling and database design involves.
51.03	Compare database development process with that of the application development process.
51.04	Identify the need for databases and why they are used.
51.05	Explain the various types of databases (i.e., flat file, relational) and the appropriate use of each.
51.06	Demonstrate proficiency in design methodology by completing appropriate tasks during the appropriate time of the developmental life cycle.
51.07	Demonstrate proficiency in design methodology by considering where the database will reside.
52.0	Develop the process of creating an entity by identifying relationships. The student will be able to:
52.01	Identify and model various types of entities.
52.02	Identify naming and drawing conventions for entities.
52.03	Sequence the steps that are necessary for creation of an entity.
52.04	Analyze and model the relationships between entities.
53.0	Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to:
53.01	Analyze and model attributes.
53.02	Identify unique identifiers for each entity.
53.03	Develop an entity relationship diagram tagging attributes with optionality.
54.0	Consider the degree and optionality of relationships of entities. The student will be able to:
54.01	Create models and entity relationship information requirements and interviews.
54.02	Begin to differentiate between one-to-many, many-to-many and one-to-one relationships.
54.03	Identify relationship between two entities by reading a given diagram.

CTE Standards and Benchmarks	
	54.04 Create a relationship between instances of the same entity.
	54.05 Read an entity relationship model in order to validate it.
55.0	Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to:
	55.01 Identify the significance of an attribute that has more than one value for each entity instance.
	55.02 Evaluate appropriate methods of storing validation rules for attributes.
	55.03 Recognize unique identifiers inherited from other entities.
	55.04 Sequence the steps involved in resolving a many-to-many relationship.
56.0	Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to:
	56.01 Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID).
	56.02 Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships.
	56.03 Enforce referential integrity.
57.0	Apply the complex ERM information by fine-tuning entities and the process for relating them. The student will be able to:
	57.01 Describe a relational database and how it is different from other database systems.
	57.02 Define primary keys and foreign keys and describe their purpose.
	57.03 Describe what data integrity refers to and list some constraints.
	57.04 Explain how database design fits into the database development process.
	57.05 Translate an entity-relationship model into a relational database design.
58.0	Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to:
	58.01 Recognize raw data and evaluate the steps for creating a data group in unnormalized form (UNF).
59.0	Manipulate data. The student will be able to:
	59.01 Determine appropriate data inputs and outputs for an existing database.
	59.02 Demonstrate proficiency in record management (i.e., entering, editing, finding, selecting, sorting, deleting records).
	59.03 Change the layout of a datasheet.
	59.04 Create forms, reports, mailing labels, and charts using a database.
	59.05 Export data to appropriate software applications.

CTE Standards and Benchmarks	
	59.06 Demonstrate proficiency in coordinating databases with appropriate software applications.
60.0	Building and modifying tables. The student will be able to:
	60.01 Create a database table.
	60.02 Create table structures and establish table relationships.
	60.03 Determine fields and assign data types in a database table.
	60.04 Demonstrate appropriate manipulation of database tables (i.e., enter data, add and delete records).
	60.05 Modify a database table by adding, deleting, and removing fields.
	60.06 Demonstrate proficiency in the appropriate use of database wizards.
61.0	Performing queries and filtering records. The student will be able to:
	61.01 Design a query and extract specific data from a database table.
	61.02 Create a calculated field.
	61.03 Filter data in records by selection and by form.
	61.04 Modify a saved query.
	61.05 Explain what a Database Warehouse and its uses.
62.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	62.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	62.02 Explain emergency procedures to follow in response to workplace accidents.
	62.03 Create a disaster and/or emergency response plan.
63.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	63.01 Employ leadership skills to accomplish organizational goals and objectives.
	63.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	63.03 Conduct and participate in meetings to accomplish work tasks.
	63.04 Employ mentoring skills to inspire and teach others.
64.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	64.01 Identify and demonstrate positive work behaviors needed to be employable.
	64.02 Develop personal career plan that includes goals, objectives, and strategies.

CTE Standards and Benchmarks	
	64.03 Examine licensing, certification, and industry credentialing requirements.
	64.04 Maintain a career portfolio to document knowledge, skills, and experience.
	64.05 Evaluate and compare employment opportunities that match career goals.
	64.06 Identify and exhibit traits for retaining employment.
	64.07 Identify opportunities and research requirements for career advancement.
	64.08 Research the benefits of ongoing professional development.
	64.09 Examine and describe entrepreneurship opportunities as a career planning option.
65.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
	65.01 Identify and describe the services and legal responsibilities of financial institutions.
	65.02 Describe the effect of money management on personal and career goals.
	65.03 Develop a personal budget and financial goals.
	65.04 Complete financial instruments for making deposits and withdrawals.
	65.05 Maintain financial records.
	65.06 Read and reconcile financial statements.
	65.07 Research, compare and contrast investment opportunities.

Florida Department of Education
Student Performance Standards

Course Title: **Programming Essentials**
Course Number: **9003450**
Course Credit: **1**

CTE Standards and Benchmarks	
66.0	Plan program design. The student will be able to:
66.01	Formulate a plan to determine program specifications individually or in groups.
66.02	Use a graphical representation or pseudocode to represent the structure in a program or subroutine.
66.03	Design programs to meet business needs and requirements using problem-solving strategies.
66.04	Prepare proper input/output layout specifications.
66.05	Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
66.06	Analyze the business needs and requirements.
66.07	Determine what kind of information the desired program must process.
66.08	Formulate concise descriptions of a program's task and purpose.
66.09	Formulate concise descriptions of task and purpose of a program's pieces.
66.10	Organize programs according to the problem analysis.
66.11	Recognize changes in the problem statement.
66.12	Suggest changes in the program organization.
67.0	Code programs. The student will be able to:
67.01	Write programs according to recognized programming standards.
67.02	Write internal documentation statements as needed in the program source code.
67.03	Code programs using logical statements (e.g., If-Then-Else, Do…While).
67.04	Enter and modify source code using a program language editor.
67.05	Code routines within programs that validate input data.
67.06	Code programs using object-oriented languages (techniques).
67.07	Select the essential aspects of a problem statement.
67.08	Provide a solution to a problem.

CTE Standards and Benchmarks	
	67.09 Find solutions to an extended problem statement.
	67.10 Utilize reference manuals and help systems.
	67.11 Use pre-defined functions within programs.
68.0	Test programs. The student will be able to:
	68.01 Develop a plan for testing programs.
	68.02 Develop data for use in program testing.
	68.03 Perform debugging activities.
	68.04 Distinguish among the different types of program and design errors.
	68.05 Evaluate program test results.
	68.06 Execute programs and subroutines as they relate to the total application.
	68.07 Develop examples that illustrate the core behavior of each program.
	68.08 Develop examples that illustrate the core behavior of each program component.
	68.09 Illustrate the behavior of boundary cases.
	68.10 Demonstrate an understanding that engineering artifacts requires rigorous and systematic testing.
	68.11 Use examples to show that the solution meets pre-determined criteria.
	68.12 Demonstrate understanding that testing can expose problems but not prove the correctness of the design in an absolute sense.
	68.13 Compile (interpret) and run programs.
69.0	Perform program maintenance. The student will be able to:
	69.01 Analyze output to identify and annotate errors or enhancements.
70.0	Create and maintain documentation. The student will be able to:
	70.01 Follow established documentation standards.
71.0	Develop an awareness of software quality assurance. The student will be able to:
	71.01 Identify the legal and social consequences of errors in software.
	71.02 Describe copyright and other laws that relate to software theft and misuse.
	71.03 Describe software security measures to protect computer systems and data from unauthorized use and tampering (e.g., physical security, passwords, encryption, virus protection/prevention).
	71.04 Develop an awareness of version control systems and Open Source Software.

CTE Standards and Benchmarks	
72.0	Develop an understanding of programming techniques and concepts. The student will be able to:
72.01	Identify the basic constructs used in structured programming.
73.0	Design structured programs. The student will be able to:
73.01	Design programs that model mathematical relationships from application areas (e.g., accounting, economics, multimedia, programming, science, web).
73.02	Design programs that deal with multi-faceted objects (e.g., personnel records, physical objects, attributes of HTML tags).
73.03	Design programs that deal with mixed classes of objects (e.g., a class of geometric shapes containing circles, rectangles, triangles, squares, polygons).
73.04	Design programs that deal with objects of undetermined size (e.g., shopping lists, family trees, file directories on computers, websites).

Florida Department of Education
Student Performance Standards

Course Title: **Web Development Technologies**
Course Number: **9003460**
Course Credit: **1**

CTE Standards and Benchmarks	
74.0	Demonstrate proficiency in page design applicable to the WWW. The student will be able to:
74.01	Identify and convert graphic formats.
74.02	Demonstrate proficiency in adding Java scripts to webpages.
75.0	Demonstrate proficiency in webpage design applicable to the WWW. The student will be able to:
75.01	Determine the objectives and the audience for webpages.
75.02	Identify design strategies to reach and keep an audience.
75.03	Use storyboarding to plan a website.
75.04	Create styles and other design elements (e.g. backgrounds, colors, fonts, buttons).
76.0	Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design. The student will be able to:
76.01	Apply style sheets for consistent website design.
76.02	Create and edit images and photographs for webpages using digital imaging software (e.g., ImageReady in Photoshop).
76.03	Insert audio files into a webpage.
76.04	Create, edit and integrate video files into a webpage.
76.05	Create, edit and integrate animation files into a webpage.
76.06	Demonstrate an understanding of photograph compression factors such as transmission speed, color reduction, and browser support.
76.07	Demonstrate knowledge of image formats related to photos and graphics on the Internet (e.g. Graphic formats (TIFF & EPS)), web formats (JPEG, GIF, PNG).
76.08	Save and export a photograph to the web in the format best for image quality and file size.
76.09	Build, optimize, edit, and test webpages for publication.
76.10	Create a webpage that utilizes plug-ins.
76.11	Demonstrate an understanding of network and web implementation issues (e.g., bandwidth, compression, streaming).
76.12	Compare and contrast various methods by which information may be accessed on the Internet/Intranet (e.g., FTP, telnet, browser).

CTE Standards and Benchmarks	
	76.13 Demonstrate an understanding of file encryption methods (e.g., secure server, unsecured server).
77.0	Demonstrate proficiency in using digital photography and digital imaging. The student will be able to:
	77.01 Demonstrate knowledge of ethics related to digital imaging and legal and consent issues.
	77.02 Apply effective design principles in digital photography compositions.
	77.03 Illustrate the essence of an event, quote, or slogan through digital photography/imaging.
	77.04 Demonstrate skill in using digital imaging software for image manipulation, color correction, and special effects to creatively convey a message or literary interpretation.
	77.05 Demonstrate skill in scanning and cropping photographs.
78.0	Design and create webpages suitable for publishing to the Internet. The student will be able to:
	78.01 Explain the need for web-based applications.
	78.02 Evaluate a website for basic usability and accessibility issues.
	78.03 Display an understanding of the purposes of site maps and wireframes.
	78.04 Develop an effective site map for a website.
	78.05 Develop effective wireframes for a website.
	78.06 Identify industry best practices in visual design.
	78.07 Explain the key concepts of meeting client needs.
	78.08 Develop an effective look and feel for a website.
	78.09 Develop an effective webpage template.
	78.10 Describe a correct directory structure, naming convention protocol, and file organization for a website.
	78.11 Characterize effective writing for the web.
	78.12 Create effective written content for the web.
	78.13 Decide how to best prepare various types of graphical content for use on a webpage.
	78.14 Develop a User Testing Plan.
	78.15 List the steps that are necessary to determine when a website is ready to launch.
	78.16 Demonstrate the ability to organize and execute a user testing of a website.
79.0	Describe how website performance is monitored and analyzed. The student will be able to:
	79.01 Identify issues related to website maintenance.

CTE Standards and Benchmarks	
	79.02 Use webpage validation tools.
	79.03 Describe website performance metrics (e.g., visits, time-on-page, time-on-site) and discuss their design implications.
	79.04 Demonstrate knowledge of accessibility problems and solutions.
	79.05 Examine indexing, page ranking, basic Search Engine Optimization techniques.
	79.06 Explore common website analytic tools.
	79.07 Construct webpages with streaming media content.
80.0	Demonstrate proficiency in hosting a website. The student will be able to:
	80.01 Apply professional guidelines to choose, search for, and register a domain name.
	80.02 Evaluate criteria upon which to select an appropriate web host.
	80.03 Make generalizations about optimal download speed for a particular website.
	80.04 Demonstrate the ability to upload and download files using FTP protocol.
	80.05 Develop a Maintenance Plan for a client.
81.0	Demonstrate the ability to attract and track traffic for a website. The student will be able to:
	81.01 Explain and describe the best practices for attracting traffic to websites.
	81.02 Evaluate an effective search engine optimization strategy.
	81.03 Describe tactics for building online credibility.
	81.04 Explain how to use standard techniques to gather and/or track site statistics.

Florida Department of Education
Student Performance Standards

Course Title: **Multimedia Technologies**
Course Number: **9003470**
Course Credit: **1**

CTE Standards and Benchmarks	
82.0	Demonstrate knowledge of presentation production issues. The student will be able to:
82.01	Identify characteristics of various types of presentations (informing, selling, teaching, entertaining).
82.02	Identify presentation materials (e.g. handouts, seminar notebooks, business cards, coupons) and presentation marketing mediums (e.g., print media such as newspaper, magazines; TV; movies; computer presentations; interactive CD ROM; kiosks, webpages).
82.03	Identify design characteristics (fonts, size and styles, backgrounds) that are suited for each type of presentation format and material.
82.04	Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedures.
82.05	Research and identify skills needed for career positions in multimedia.
82.06	Demonstrate an understanding of graphic and other file formats (e.g., EPS, TIFF, JPEG, ASCII, MPEG, MIDI, AVI, WAV) and knowledge of image size when scanning and saving files for use in different presentation types (web, computer, print).
82.07	Demonstrate knowledge of presentation vocabulary/terms.
83.0	Demonstrate proficiency in using digital photography and digital imaging. The student will be able to:
83.01	Demonstrate knowledge of ethics related to digital imaging and legal and consent issues.
83.02	Apply effective design principles in digital photography compositions.
83.03	Illustrate the essence of an event, quote, or slogan through digital photography/imaging.
83.04	Demonstrate skill in using digital imaging software for image manipulation, color correction, and special effects to creatively convey a message or literary interpretation.
83.05	Demonstrate skill in scanning and cropping photographs.
83.06	Incorporate scanned or digitally taken photographs into documents (poster, brochure, card, photo journalism story, report or book covers, letterhead) that have been designed using desktop publishing software or the desktop publishing features of word processing software.
84.0	Demonstrate basic video production. The student will be able to:
84.01	Use student device or current industry standard production video equipment.
84.02	Operate camera in studio and location (field) production environments.
84.03	Demonstrate understanding of digital video storage concepts and digital storage media.

CTE Standards and Benchmarks	
	84.04 Demonstrate knowledge of and the ability to operate digital recording decks, and other digital storage devices.
	84.05 Identify and select microphones for production needs.
	84.06 Determine appropriate lighting needs for production settings.
	84.07 Identify location and studio lighting types, method of use and application.
85.0	Demonstrate set-up and configuration of a computer for video applications. The student will be able to:
	85.01 Install basic peripheral devices related to video programs.
	85.02 Install and configure software related to video programs.
	85.03 Demonstrate basic knowledge of computer system requirements.
	85.04 Demonstrate basic knowledge of installing plug-ins or additional audio source material such as beats and or samples.
	85.05 Understand the signal flow of a digital video workstation.
86.0	Demonstrate the basic operation of a video workstation. The student will be able to:
	86.01 Demonstrate knowledge of the digital video workstation interface.
	86.02 Demonstrate a working familiarity and understanding of the function and operation of digital video workstations.
	86.03 Describe a full digital media production cycle.
	86.04 Demonstrate ability to edit, cut, erase, and insert video utilizing various digital production techniques.
	86.05 Record video directly to the digital video workstation.
	86.06 Demonstrate knowledge of editing video according to message.
	86.07 Demonstrate skill in using video effects and plug-ins.
	86.08 Describe a first complete run-through of the video production process.
	86.09 Characterize the qualities of effective communication in a completed video.
	86.10 Prepare a video project for final compositing and export.
	86.11 Transfer video files between various video software applications.
	86.12 Export finished video.
	86.13 Identify and describe solutions to the challenges and obstacles that arise in a video production.
87.0	Demonstrate basic audio production. The student will be able to:
	87.01 Describe digital audio storage concepts and digital storage media.

CTE Standards and Benchmarks	
	87.02 Operate digital recording decks and other digital storage devices.
	87.03 Describe the function and operation of digital audio workstations.
	87.04 Edit, cut, erase, and insert sound utilizing various digital production techniques.
	87.05 Perform digital noise reduction and noise extraction via spectral display.
88.0	Set-up and configure a computer for audio applications. The student will be able to:
	88.01 Install basic peripheral devices related to audio programs.
	88.02 Install and configure software related to audio programs.
	88.03 Demonstrate basic knowledge of computer system requirements.
	88.04 Install plug-ins or additional audio source material such as beats and or samples.
	88.05 Diagram the signal flow of a digital audio workstation.
89.0	Operate an audio workstation. The student will be able to:
	89.01 Demonstrate knowledge of the digital audio workstation interface.
	89.02 Create and arrange a multi-track project.
	89.03 Create interest and effect using editing techniques.
	89.04 Design and edit audio using a waveform editor.
	89.05 Record audio directly to the digital audio workstation.
	89.06 Mix audio.
	89.07 Demonstrate skill in using audio effects and plug-ins.
	89.08 Prepare an audio project for finishing and final mix down.
	89.09 Transfer audio files between various audio software applications.
	89.10 Demonstrate the understanding of audio file bit depth, bandwidth and dithering and be able to explain when and where these apply in various applications of digital audio production.
	89.11 Export finished audio.
90.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
	90.01 Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
	90.02 Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g., project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers).

CTE Standards and Benchmarks
90.03 Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation.

Florida Department of Education
Student Performance Standards

Course Title: **Computer Networking Fundamentals**
Course Number: **9003480**
Course Credit: **1**

CTE Standards and Benchmarks	
91.0	Demonstrate understanding of network technologies. The student will be able to:
91.01	Explain the function of common networking protocols such as TCP,FTP, UDP, TCP/IP suite, DHCP, TFTP, DNS, HTTP(S), ARP, SIP (VoIP), RTP (VoIP), SSH, POP3, NTP, IMAP4, TELNET, SMTP, SNMP 2/3, ICMP, IGMP, TLS.
91.02	Identify commonly used TCP and UDP default ports such as TCP ports, FTP – 20, 21, SSH – 22, TELNET – 23, SMTP – 25, DNS – 53, HTTP – 80, POP3 – 110, NTP – 123, IMAP4 – 143, HTTPS – 443, UDP ports TFTP – 69, DNS – 53, BOOTPS/DHCP – 67, SNMP – 161.
91.03	Identify the following address formats IPv6, IPv4, and MAC Addressing.
91.04	Evaluate the proper use of the following addressing technologies and addressing schemes: Subnetting, Classful vs. classless (e.g. CIDR, Supernetting), NAT, PAT, SNAT, Public vs. private, DHCP (static, dynamic APIPA), Addressing schemes, Unicast, Multicast, Broadcast.
91.05	Identify common IPv4 and IPv6 routing protocols - Link state OSPF, IS-IS, Distance vector, RIP, RIPv2, BGP, Hybrid EIGRP.
91.06	Explain the purpose and properties of routing such as IGP vs EGP, Static vs dynamic, Next Hop, understanding routing tables and how they pertain to path selection, and explain convergence (steady state).
91.07	Compare the characteristics of wireless communication standards such as 802.11 a/b/g/n, speeds, distance, channels, frequency, authentication and encryption such as WPA, WEP, RADIUS, and TKIP.
92.0	Understand, install, and configure network hardware. The student will be able to:
92.01	Categorize standard cable types and their properties such as CAT3, CAT5, CAT5e, CAT6, STP, UTP, Multimode fiber, single-mode fiber, coaxial, serial, plenum vs. non-plenum, transmission speeds, distance, duplex, noise immunity (security, EMI), and frequency.
92.02	Identify common connector types such as RJ-11, RJ-45, BNC, SC, ST, LC, RS-232.
92.03	Identify common physical network topologies such as Star, Mesh, Bus, Ring, Point to Point, Point to Multipoint, and Hybrid.
92.04	Differentiate and implement appropriate wiring standards such as 568A, 568 B Straight vs. cross over, rollover, and Loopback.
92.05	Categorize Wan technologies types and properties such as Frame Relay, E1/T1, ADSL, SDSL, VDSL, Cable modem, Satellite, E3/T3, Oc-x, Wireless, ATM, SONET, MPLS, ISD Bri, ISDN PRI, POTS, PSTN, Circuit, switch, packet switch, speed, transmission media, and Distance.
92.06	Categorize LAN technology types and properties such as Ethernet, 10BaseT, 100BaseTX, 100BaseFX, 1000BaseT, 1000BaseX, 10GbaseSR, 10GBaseLR, 10GBaseER, 10GBaseSW, 10GBaseLW, 10GBaseEW, 10GBaseT and properties of each such as CSMA/CD, Broadcast, Collision, Bonding, Speed, and Distance.
92.07	Explain common logical network topologies and their characteristics such as peer to peer, client/server, VPN, VLAN.

CTE Standards and Benchmarks	
92.08	Install components of wiring distribution such as Vertical and horizontal cross connects, Patch panels, 66 block, MDFs, IDFs, 25 pair, 100 pair, 110 block, Demarc, Demarc extension, Smart jack, verify wiring installation, and Verify wiring termination.
93.0	Understand, install and configure networking devices. The student will be able to:
93.01	Install, configure and differentiate between common network devices such as hub, repeater, modem, NIC, media converters, basic switch, bridge, wireless access point, basic router, basic firewall, basic DHCP server.
93.02	Identify the function of specialized network devices such as multilayer switch, Content switch, IDS/IPS, load balancer, multifunction network devices, DNS server Bandwidth shaper, proxy server, and CSU/DSU.
93.03	Explain the advance features of a switch such as PoE, Spanning tree, VLAN, Trunking, Port mirroring, and Port Authentication.
93.04	Implement a basic wireless network using the following technologies installed client, access point placement, access point with encryption, access point with configured channels and frequencies, and a set ESSSID and beacon.
94.0	Understand, install and configure network management software. The student will be able to:
94.01	Explain the function of the OSI layer model such as physical, data link, network, transport, session, presentation, and application.
94.02	Identifies types of configuration management documentation such as wiring schematics, physical and logical network diagram, baselines, policies, procedure and configuration and regulations.
94.03	Evaluate the network based on configuration management documentation such as compare wiring schematics, physical and logical network diagrams, baselines, policies and procedures, and configurations to network devices and infrastructure, and update wiring schematics, physical and logical network diagrams, configuration and job logs as needed.
94.04	Conduct network monitoring to identify performance and connectivity issues using the following: network monitoring utilities (packet sniffers, connectivity software, load testing, throughput testers) and system logs, history, event log.
94.05	Conduct network monitoring to identify performance and connectivity issues using the following: network monitoring utilities (packet sniffers, connectivity software, load testing, and throughput testers), system logs, history logs, and event logs.
94.06	Explain different methods and rationales for network performance optimization such as QoS, Traffic shaping, Load balancing, high availability, Caching engines, Fault tolerance, Latency sensitivity, High bandwidth applications, VoIP, Video applications, and Uptime.
94.07	Implement the following network troubleshooting methodology - Information gathering, identify symptoms and problems, Identify the affected areas of the network, determine if anything has changed, Establish the most probable cause, determine if escalation is necessary, Create an action plan and solution identifying potential effects, Implement and test the solution, Identify the results and effects of the solution, and Document the solution and the entire process.
94.08	Troubleshoot common connectivity issues and select an appropriate solution Physical issues: Cross talk, Near End crosstalk, Attenuation, collisions, Shorts Open, Impedance mismatch (echo), and Interference - Logical issues: Port speed, Port duplex mismatch, incorrect VLAN, Incorrect IP address, Wrong gateway, Wrong DNS, Wrong subnet mask, Issues that should be identified but escalated: Switching loop, Routing loop, Route problems, Proxy arp, Broadcast storms, Wireless Issues: Interference (bleed, environmental factors), incorrect encryption, Incorrect channel, Incorrect frequency, ESSID mismatch, Standard mismatch (802.11 a/b/g/n), Distance, Bounce, and Incorrect antenna placement.
95.0	Understand, install and configure networking tools. The student will be able to:
95.01	Select the appropriate command line interface tool and interpret the output to verify functionality such as Traceroute, Ipconfig, IFconfig, Ping, Arp ping, Arp, Nslookup, Hostname, Dig, Mtr, Route, and Nbtstat.

CTE Standards and Benchmarks	
95.02	Explain the purpose of network scanners such as Packet sniffers, Intrusion detection software, Intrusion prevention software, Port scanners.
95.03	Utilize the appropriate hardware tools such as Cable testers, Protocol analyzer, Certifiers, TDR, OTDR, Multimeter, Toner probe, Butt set, Punch down tool, Cable stripper, Snips, Voltage event recorder, and Temperature monitor.
96.0	Install, configure, and manage network security hardware and software devices. The student will be able to:
96.01	Explain the function of hardware and software security devices such as Network based firewall, Host based firewall, IDS, IPS, and VPN concentrator.
96.02	Explain common features of a firewall for example: Application layer vs. network layer, Stateful vs. stateless, Scanning services, Content filtering, Signature identification, and Zones.
96.03	Explain the methods of network access security using the following: Filtering: ACL, MAC filtering, IP filtering, Tunneling and encryption, SSL VPN, VPN, L2TP, PPTP, IPSEC, Remote access, RAS, RDP, PPPoE, PPP, VNC, and ICA.
96.04	Explain methods of user authentication using the following methods: PKI, Kerberos, AAA, RADIUS, TACACS+, Network access control, 802.1x, CHAP, MS-CHAP, and EAP.
96.05	Explain issues that affect device security such as the Physical security, Restricting local and remote access, Secure methods vs. unsecure methods, SSH, HTTPS, SNMPv3, SFTP, SCP, and TELNET, HTTP, FTP, RSH, RCP, SNMPv1/2.
96.06	Identify common security threats and mitigation techniques such as Security threats, DoS, Viruses, Worms, Attackers, Man in the middle, murf, Rogue access points, Social engineering (phishing), Mitigation techniques, Policies and procedures, User training, Patches and updates.

Florida Department of Education
Student Performance Standards

Course Title: **Cybersecurity Fundamentals**
Course Number: **9003490**
Course Credit: **1**

CTE Standards and Benchmarks	
97.0	Demonstrate an understanding of cybersecurity, the terminology used, its history and culture, and trends. The student will be able to:
97.01	Describe the history of cybersecurity, including the evolution of a hacker culture.
97.02	Discuss the trends and national initiatives related to cybersecurity.
97.03	Distinguish between information assurance and cybersecurity.
97.04	Describe the concepts of confidentiality as it relates to user and data impact.
97.05	Explain authentication and the concept of non-repudiation.
97.06	Describe the concept of “Hacking - The Human Element” and elaborate on its implications to cybersecurity.
98.0	Recognize the following types of malicious code and specify the appropriate actions to take to mitigate vulnerability and risk. The student will be able to:
98.01	Describe viruses.
98.02	Identify Trojan Horses.
98.03	Explain Logic Bombs.
98.04	Describe worms.
98.05	Explain exploit kits.
98.06	Identify kill chains.
99.0	Recognize and be able to differentiate and explain the following access control models. The student will be able to:
99.01	Define MAC (Mandatory Access Control).
99.02	Define DAC (Discretionary Access Control).
99.03	Define RBAC (Role Based Access Control).
100.0	Compare and contrast methods of authentication. The student will be able to:
100.01	Identify Kerberos.
100.02	Explain CHAP (Challenge Handshake Authentication Protocol).

CTE Standards and Benchmarks	
	100.03 Define certificates.
	100.04 Apply username/password.
	100.05 Identify tokens.
	100.06 Describe multi-factor.
	100.07 Define mutual.
	100.08 Define biometrics.
101.0	Recognize the following attacks and specify the appropriate actions to take to mitigate vulnerability and risk. The student will be able to:
	101.01 Explain DOS/DDOS (Denial of Service/Distributed Denial of Service).
	101.02 Explain Back Door.
	101.03 Identify spoofing.
	101.04 Describe Man in the Middle.
	101.05 Describe replay.
	101.06 Explain TCP/IP Hijacking.
	101.07 List Weak Keys.
	101.08 Design password security measures to eliminate guessing (e.g., Brute Force, Dictionary, Mathematical, Social Engineering, Birthday).
	101.09 Describe Software Exploitation.
102.0	Demonstrate an understanding of the processes and risks associated with the following security concerns and tasks. The student will be able to:
	102.01 Identify non-essential services and protocols and know what actions to take to reduce the risks of those services and protocols.
	102.02 Understand the concept of and know how reduce the risks of social engineering.
	102.03 Understand the concept and significance of auditing, logging and system scanning.
	102.04 Identify and be able to differentiate different cryptographic standards and protocols.
103.0	Demonstrate an understanding of the administration of the following types of remote access technologies. The student will be able to:
	103.01 Recognize 802.1x.
	103.02 Understand VPN (Virtual Private Network).
	103.03 Discuss RADIUS (Remote Authentication Dial-In User Service).
	103.04 Describe TACACS (Terminal Access Controller Access Control System).

CTE Standards and Benchmarks	
	103.05 Generalize L2TP/PPTP (Layer Two Tunneling Protocol/Point to Point Tunneling Protocol).
	103.06 Define SSH (Secure Shell).
	103.07 Give examples of IPSEC (Internet Protocol Security).
	103.08 List security vulnerabilities.
104.0	Demonstrate an understanding of the administration of the following email security concepts. The student will be able to:
	104.01 Explain S/MIME (Secure Multipurpose Internet Mail Extensions).
	104.02 Describe PGP (Pretty Good Privacy) like technologies.
	104.03 List security vulnerabilities.
	104.04 Identify SPAM.
	104.05 Analyze hoaxes.
	104.06 Track SMTP headers.
105.0	Demonstrate an understanding of the administration of the following Internet security concepts. The student will be able to:
	105.01 Recognize SSL/TLS (Secure Sockets Layer/Transport Layer Security).
	105.02 Understand HTTP/S (Hypertext Transfer Protocol/Hypertext Transfer Protocol over Secure Sockets Layer).
	105.03 List security vulnerabilities.
106.0	Demonstrate an understanding of the administration of the following vulnerabilities. The student will be able to:
	106.01 Discuss Java Script.
	106.02 Explain ActiveX.
	106.03 Identify Buffer Overflows.
	106.04 Understand Cookies.
	106.05 Explain Signed Applets.
	106.06 Identify CGI (Common Gateway Interface).
	106.07 Describe SMTP (Simple Mail Transfer Protocol) Relay.
107.0	Demonstrate an understanding of the administration of the following directory security concepts. The student will be able to:
	107.01 Recognize SSL/TLS (Secure Sockets Layer/Transport Layer Security).
	107.02 Recognize LDAP (Lightweight Directory Access Protocol).

CTE Standards and Benchmarks	
108.0	Demonstrate an understanding of the administration of the following file transfer protocols and concepts. The student will be able to:
108.01	Identify S/FTP (File Transfer Protocol).
108.02	Identify Blind FTP (File Transfer Protocol)/Anonymous.
108.03	Understand File Sharing.
108.04	List security vulnerabilities.
109.0	Demonstrate an understanding of the administration of the following wireless technologies and concepts. The student will be able to:
109.01	Recognize WTLS (Wireless Transport Layer Security).
109.02	Recognize 802.11 and 802.11x.
109.03	Recognize WEP/WAP (Wired Equivalent Privacy/Wireless Application Protocol).
109.04	List security vulnerabilities.
110.0	Compare and contrast the following types of intrusion detection in terms of implementation and configuration. The student will be able to:
110.01	Discuss Network Based – Active and Passive.
110.02	Discuss Host Based – Active and Passive.
110.03	Explain Honey Pots.
110.04	Describe Incident Response.
111.0	Identify and explain the following different kinds of cryptographic algorithms. The student will be able to:
111.01	Explain Hashing.
111.02	Explain Symmetric.
111.03	Explain Asymmetric.
112.0	Understand how cryptography and digital signatures address the following security concepts. The student will be able to:
112.01	Discuss confidentiality.
112.02	Evaluate integrity.
112.03	Determine authentication.
112.04	Ensure non-repudiation.
112.05	Evaluate access control.
113.0	Understand the following concepts of PKI (Public Key Infrastructure). The student will be able to:

CTE Standards and Benchmarks	
	113.01 Explain certificates (e.g., policies, practice statements).
	113.02 Discuss revocation.
	113.03 Identify trust models.
114.0	Understand the following concepts of Key Management and Certificate Lifecycles. The student will be able to:
	114.01 Compare and contrast centralized versus decentralized.
	114.02 Compare and contrast hardware versus software key storage.
	114.03 Explain private key storage.
	114.04 Identify escrow.
	114.05 Explain expiration.
	114.06 Compare and contrast revocation versus suspension (e.g., status checking).
	114.07 Interpret recovery authorization schema (e.g., M-of-N Control - Of M appropriate individuals, N must be present to authorize recovery).
	114.08 Explain renewal.
	114.09 Give examples of destruction.
	114.10 Discuss key usage.
	114.11 Compare and contrast multiple key pairs (Single, Dual).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Integrated Information Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9003500
CIP Number	0511010314
Grade Level	9-12
Program Length	5 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to computer application skills including computer hardware, software applications, web applications, computer programming, webpage design and advanced web tools, systems support and maintenance, network concepts, relational database concepts, multimedia tools, cybersecurity ; extensive exploration of information technology careers; strategies for success including goal setting, study skills, organizing skills, learning styles, employability skills, and service learning; and core academic skills with a strong emphasis on effective communication skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
9003520	Web Development Principles	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7 G	1 credit	15-1151	3	CT
9003540	Programming Principles		1 credit	15-1151	3	CT
0200335	**OR** *AP Computer Science Principles*	ANY FIELD WHEN CERT REFLECTS BACHELOR OR HIGHER COMPU SCI 6	1 credit	15-1131	3	MA
9003530	Database Principles	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7 G	1 credit	15-1151	3	CT
9003510	IT Principles		1 credit	15-1151	3	CT
9003550	Cloud Principles		1 credit	15-1151	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

01.0 Demonstrate proficiency on the principles of design.
02.0 Demonstrate proficiency planning an effective website.
03.0 Demonstrate proficiency using web development tools and techniques.
04.0 Demonstrate proficiency using specialized web design software.
05.0 Demonstrate proficiency gathering and preparing web content.
06.0 Demonstrate an awareness of preparing a website for launch.
07.0 Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design.
08.0 Demonstrate proficiency in using digital photography and digital imaging.
09.0 Design and create webpages suitable for publishing to the Internet.
10.0 Describe how website performance is monitored and analyzed.
11.0 Demonstrate proficiency in hosting a website.
12.0 Demonstrate the ability to attract traffic for a website.
13.0 Plan program design.
14.0 Code programs.
15.0 Test programs.
16.0 Perform program maintenance.
17.0 Create and maintain documentation.
18.0 Develop an awareness of software quality assurance.
19.0 Develop an understanding of programming techniques and concepts.
20.0 Design and organization of structured programs into components, modules and subsystems.
21.0 Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs.
22.0 Develop the process of creating an entity by identifying relationships.
23.0 Formulate and assemble initial entity relationship by expanding on modeling concepts.
24.0 Consider the degree and optionality of relationships of entities.
25.0 Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams.
26.0 Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships.
27.0 Apply the complex ERM information by fine-tuning entities and the process for relating them.
28.0 Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved.
29.0 Manipulate data.
30.0 Building and modifying tables.
31.0 Performing queries and filtering records.
32.0 Explain motherboard components, types and features.
33.0 Explain the purpose and characteristics of CPUs and their features.
34.0 Perform installation and configuration activities.
35.0 Demonstrate proficiency using computer networks.
36.0 Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact.

37.0 Demonstrate knowledge of presentation production issues.
38.0 Demonstrate proficiency communicating over the Internet.
39.0 Demonstrate proficiency in troubleshooting, repair and maintenance of computers.
40.0 Demonstrate proficiency in the basic principles of security concepts and technologies.
41.0 Demonstrate proficiency in operational procedures as they relate to computer equipment and components.
42.0 Demonstrate proficiency in information technology tools.
43.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
44.0 Describe the importance of professional ethics and legal responsibilities.
45.0 Evaluate and analyze concepts used in cloud computing.
46.0 Identify the components of cloud-based services.
47.0 Evaluate cloud-based services.
48.0 Use cloud-based services.
49.0 Evaluate and analyze techniques and methods of cloud deployment, and design principles of secure cloud computing.
50.0 Evaluate the risks of cloud-based systems.
51.0 Demonstrate an awareness of cloud implementation security concepts.

Florida Department of Education
Student Performance Standards

Course Title: **Web Development Principles**
Course Number: **9003520**
Course Credit: **1**

CTE Standards and Benchmarks	
01.0	Demonstrate proficiency on the principles of design. The student will be able to:
01.01	Identify industry best practices in visual design.
01.02	Determine the objectives and the audience for webpages.
01.03	Apply the principles of Human Computer Interface (HCI) to design and develop an effective look and feel for a website.
01.04	Design and create responsive webpages using RWD principles in HTML and CSS.
02.0	Demonstrate proficiency planning an effective website. The student will be able to:
02.01	Compare and contrast site maps and wireframes.
02.02	Develop an effective site map for a website.
02.03	Use storyboarding to plan a website.
02.04	Create page layout wireframes for a website.
02.05	Classify web development tasks according to when they are performed during the web development cycle.
02.06	Describe the different types of business requirements that apply to website design.
02.07	Design business requirements to help ensure success for a specific website.
02.08	Demonstrate ability to use effective designer-client communication skills.
03.0	Demonstrate proficiency using web development tools and techniques. The student will be able to:
03.01	Compare and contrast writing HTML using a text editor versus using a WYSIWYG editor.
03.02	Design and create an effective webpage template.
03.03	Create attractive, engaging, and efficient webpages using a WYSIWYG editor.
03.04	Create an appropriate directory structure, naming convention protocol, and file organization for a website.
03.05	Create styles and other design elements.
03.06	Create DHTML and XML documents using editors or converters.
04.0	Demonstrate proficiency using specialized web design software. The student will be able to:

CTE Standards and Benchmarks	
	04.01 Compare and contrast various specialized web design software.
	04.02 Demonstrate proficiency using various specialized web design software.
	04.03 Demonstrate proficiency in adding Java scripts to webpages.
05.0	Demonstrate proficiency gathering and preparing web content. The student will be able to:
	05.01 Characterize effective writing styles and conventions for the web.
	05.02 Create effective written content for the web.
	05.03 Prepare various types of graphical content for use on a webpage.
	05.04 Access and digitize graphics through various resources.
	05.05 Identify and convert graphic formats.
	05.06 Create, edit and integrate images using image or graphic design software.
	05.07 Create, edit and integrate video files into a webpage.
	05.08 Insert audio files into a webpage.
	05.09 Compare and contrast static versus dynamic web content.
06.0	Demonstrate an awareness of preparing a website for launch. The student will be able to:
	06.01 Evaluate a website for basic usability and accessibility issues.
	06.02 List the steps that are necessary to determine when a website is ready to launch.
	06.03 Develop a User Testing Plan.
	06.04 Demonstrate the ability to organize and execute a user testing of a website.
	06.05 Demonstrate proficiency in publishing to the Internet.
07.0	Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design. The student will be able to:
	07.01 Apply style sheets for consistent website design.
	07.02 Create and edit images and photographs for webpages using digital imaging software.
	07.03 Insert audio files into a webpage.
	07.04 Create, edit and integrate video files into a webpage.
	07.05 Create, edit and integrate animation files into a webpage.
	07.06 Demonstrate an understanding of photograph compression factors such as transmission speed, color reduction, and browser support.

CTE Standards and Benchmarks	
	07.07 Demonstrate knowledge of image formats related to photos and graphics on the Internet, web formats.
	07.08 Save and export a photograph to the web in the format best for image quality and file size.
	07.09 Build, optimize, edit, and test webpages for publication.
	07.10 Create a webpage that utilizes plug-ins.
	07.11 Demonstrate an understanding of network and web implementation issues.
	07.12 Compare and contrast various methods by which information may be accessed on the Internet/Intranet.
	07.13 Demonstrate an understanding of file encryption methods.
08.0	Demonstrate proficiency in using digital photography and digital imaging. The student will be able to:
	08.01 Demonstrate knowledge of legal and ethical issues relating to digital imaging.
	08.02 Apply effective design principles in digital photography compositions.
	08.03 Illustrate the essence of an event, quote, or slogan through digital photography/imaging.
	08.04 Demonstrate skill in using digital imaging software for image manipulation, color correction, and special effects to creatively convey a message or literary interpretation.
	08.05 Demonstrate skill in scanning and cropping photographs.
09.0	Design and create webpages suitable for publishing to the Internet. The student will be able to:
	09.01 Explain the need for web-based applications.
	09.02 Evaluate a website for basic usability and accessibility issues.
	09.03 Display an understanding of the purposes of site maps and wireframes.
	09.04 Develop an effective site map for a website.
	09.05 Develop effective wireframes for a website.
	09.06 Identify industry best practices in visual design.
	09.07 Explain the key concepts of meeting client needs.
	09.08 Develop an effective look and feel for a website.
	09.09 Develop an effective webpage template.
	09.10 Describe a correct directory structure, naming convention protocol, and file organization for a website.
	09.11 Characterize effective writing for the web.
	09.12 Create effective written content for the web.

CTE Standards and Benchmarks	
	09.13 Decide how to best prepare various types of graphical content for use on a webpage.
	09.14 Develop a User Testing Plan.
	09.15 List the steps that are necessary to determine when a website is ready to launch.
	09.16 Demonstrate the ability to organize and execute a user testing of a website.
10.0	Describe how website performance is monitored and analyzed. The student will be able to:
	10.01 Identify issues related to website maintenance.
	10.02 Use webpage validation tools.
	10.03 Describe website performance metrics and discuss their design implications.
	10.04 Demonstrate knowledge of accessibility problems and solutions.
	10.05 Examine indexing, page ranking, basic Search Engine Optimization techniques.
	10.06 Explore common website analytic tools.
11.0	Demonstrate proficiency in hosting a website. The student will be able to:
	11.01 Apply professional guidelines to search for, choose, and register a domain name.
	11.02 Evaluate criteria upon which to select an appropriate web host.
	11.03 Make generalizations about optimal download speed for a particular website.
	11.04 Demonstrate the ability to upload and download files using FTP protocol.
	11.05 Develop a Maintenance Plan for a client.
12.0	Demonstrate the ability to attract traffic for a website. The student will be able to:
	12.01 Explain and describe the best practices for attracting traffic to websites.
	12.02 Evaluate an effective search engine optimization strategy.
	12.03 Describe tactics for building online credibility.
	12.04 Explain how to use standard techniques to gather and/or track site statistics.

Florida Department of Education
Student Performance Standards

Course Title: **Programming Principles**
Course Number: **9003540**
Course Credit: **1**

CTE Standards and Benchmarks	
13.0	Plan program design. The student will be able to:
13.01	Formulate a plan to determine program specifications individually or in groups.
13.02	Use a graphical representation or pseudocode to represent the structure in a program or subroutine.
13.03	Design programs to solve problems using problem-solving strategies.
13.04	Prepare proper input/output layout specifications.
13.05	Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
13.06	Analyze problem statements.
13.07	Determine what kind of information the desired program must process.
13.08	Formulate concise descriptions of a program's task and purpose.
13.09	Formulate concise descriptions of task and purpose of a program's pieces.
13.10	Organize programs according to the problem analysis.
13.11	Recognize changes in the problem statement.
13.12	Suggest changes in the program organization.
14.0	Code programs. The student will be able to:
14.01	Write programs according to recognized programming standards.
14.02	Write internal documentation statements as needed in the program source code.
14.03	Code programs using logical statements.
14.04	Enter and modify source code using a program language editor.
14.05	Code routines within programs that validate input data.
14.06	Code programs using object-oriented languages (techniques).
14.07	Select the essential aspects of a problem statement.
14.08	Find solutions to an extended problem statement.

CTE Standards and Benchmarks	
	14.09 Use reference manuals and help systems.
	14.10 Use pre-defined functions within programs.
15.0	Test programs. The student will be able to:
	15.01 Develop a plan for testing programs.
	15.02 Develop data for use in program testing.
	15.03 Perform debugging activities.
	15.04 Distinguish among the different types of program and design errors.
	15.05 Evaluate program test results.
	15.06 Execute programs and subroutines as they relate to the total application.
	15.07 Develop examples that illustrate the core behavior of each program.
	15.08 Develop examples that illustrate the core behavior of each program component.
	15.09 Illustrate the behavior of boundary cases.
	15.10 Demonstrate an understanding that engineering artifacts requires rigorous and systematic testing.
	15.11 Use examples to show that the solution meets pre-determined criteria.
	15.12 Demonstrate understanding that testing can expose problems but not prove the correctness of the design in an absolute sense.
	15.13 Compile (interpret) and run programs.
16.0	Perform program maintenance. The student will be able to:
	16.01 Analyze output to identify and annotate errors or enhancements.
17.0	Create and maintain documentation. The student will be able to:
	17.01 Follow established documentation standards.
18.0	Develop an awareness of software quality assurance. The student will be able to:
	18.01 Identify the legal and social consequences of errors in software.
	18.02 Develop an awareness of version control systems.
	18.03 Describe software’s functional quality.
	18.04 Describe software’s structural quality.
19.0	Develop an understanding of programming techniques and concepts. The student will be able to:

CTE Standards and Benchmarks	
	19.01 Identify the basic constructs used in structured programming.
20.0	Design and organization of structured programs into components, modules and subsystems. The student will be able to:
	20.01 Design programs that model mathematical relationships from application areas.
	20.02 Design programs that deal with multi-faceted objects.
	20.03 Design programs that deal with mixed classes of objects.
	20.04 Design programs that deal with objects of undetermined size.

Florida Department of Education
Student Performance Standards

Course Title: **Database Principles**
Course Number: **9003530**
Course Credit: **1**

CTE Standards and Benchmarks	
21.0	Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs. The student will be able to:
21.01	Identify and analyze the phases of the database development process.
21.02	Explain what conceptual data modeling and database design involves.
21.03	Compare database development process with that of the application development process.
21.04	Identify the need for databases and why they are used.
21.05	Explain the various types of databases and the appropriate use of each.
21.06	Demonstrate proficiency in design methodology by completing appropriate tasks during the appropriate time of the developmental life cycle.
21.07	Demonstrate proficiency in design methodology by considering where the database will reside.
22.0	Develop the process of creating an entity by identifying relationships. The student will be able to:
22.01	Identify and model various types of entities.
22.02	Identify naming and drawing conventions for entities.
22.03	Sequence the steps that are necessary for creation of an entity.
22.04	Analyze and model the relationships between entities.
23.0	Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to:
23.01	Analyze and model attributes.
23.02	Identify unique identifiers for each entity.
23.03	Develop an entity relationship diagram tagging attributes with optionality.
24.0	Consider the degree and optionality of relationships of entities. The student will be able to:
24.01	Create models and entity relationship information requirements and interviews.
24.02	Begin to differentiate between one-to-many, many-to-many and one-to-one relationships.
24.03	Identify relationship between two entities by reading a given diagram.

CTE Standards and Benchmarks	
	24.04 Create a relationship between instances of the same entity.
	24.05 Read an entity relationship model in order to validate it.
25.0	Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to:
	25.01 Identify the significance of an attribute that has more than one value for each entity instance.
	25.02 Evaluate appropriate methods of storing validation rules for attributes.
	25.03 Recognize unique identifiers inherited from other entities.
	25.04 Sequence the steps involved in resolving a many-to-many relationship.
26.0	Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to:
	26.01 Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID).
	26.02 Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships.
	26.03 Enforce referential integrity.
27.0	Apply the complex ERM information by fine-tuning entities and the process for relating them. The student will be able to:
	27.01 Describe a relational database and how it is different from other database systems.
	27.02 Define primary keys and foreign keys and describe their purpose.
	27.03 Describe what data integrity refers to and list some constraints.
	27.04 Explain how database design fits into the database development process.
	27.05 Translate an entity-relationship model into a relational database design.
28.0	Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to:
	28.01 Recognize raw data and evaluate the steps for creating a data group in unnormalized form (UNF).
	28.02 Demonstrate proficiency in querying and accessing data.
	28.03 Demonstrate an understanding of the implications of storing sensitive information.
29.0	Manipulate data. The student will be able to:
	29.01 Determine appropriate data inputs and outputs for an existing database.
	29.02 Demonstrate proficiency in record management.
	29.03 Change the layout of a datasheet.

CTE Standards and Benchmarks	
	29.04 Create forms, reports, mailing labels, and charts using a database.
	29.05 Export data to appropriate software applications.
	29.06 Demonstrate proficiency in coordinating databases with appropriate software applications.
30.0	Building and modifying tables. The student will be able to:
	30.01 Create a database table.
	30.02 Create table structures and establish table relationships.
	30.03 Determine fields and assign data types in a database table.
	30.04 Demonstrate appropriate manipulation of database tables.
	30.05 Modify a database table by adding, deleting, and removing fields.
	30.06 Demonstrate proficiency in the appropriate use of database wizards.
31.0	Performing queries and filtering records. The student will be able to:
	31.01 Design a query and extract specific data from a database table.
	31.02 Create a calculated field.
	31.03 Filter data in records by selection and by form.
	31.04 Modify a saved query.

Florida Department of Education
Student Performance Standards

Course Title: **IT Principles**
Course Number: **9003510**
Course Credit: **1**

CTE Standards and Benchmarks	
32.0	Explain motherboard components, types and features. The student will be able to:
32.01	Identify different motherboard form factors.
32.02	Identify input/output interfaces.
32.03	Identify the different types of bus slots.
32.04	Identify the BIOS/CMOS/Firmware.
32.05	Define Assembler (asm) language and describe the purpose.
33.0	Explain the purpose and characteristics of CPUs and their features. The student will be able to:
33.01	Identify types of CPUs.
33.02	Define hyper threading.
33.03	Explain multi core.
33.04	Explain the difference between onboard cache.
33.05	Compare and contrast between real and actual speed.
33.06	Compare and contrast between 32 bit and 64 bit processing.
34.0	Perform installation and configuration activities. The student will be able to:
34.01	Install and configure software including device drivers.
34.02	Install and configure operating system software.
34.03	Install and configure application software.
34.04	Install and configure peripherals including device drivers.
34.05	Supervise the testing of operating system management systems.
34.06	Prepare the hard disk and related issues for operating system installation.
34.07	Format and partition the hard disk.
34.08	Verify the proper operation of the system.

CTE Standards and Benchmarks	
	34.09 Compare and contrast memory technologies.
	34.10 Demonstrate proficiency using various memory technologies.
	34.11 Demonstrate proper use of user interfaces, command utilities, and troubleshooting utilities.
	34.12 Explain the basics of boot sequences, methods and startup utilities.
35.0	Demonstrate proficiency using computer networks. The student will be able to:
	35.01 Define networking and describe the purpose of a network.
	35.02 Describe various types of networks and the advantages and disadvantages of each.
	35.03 Describe the use, advantages, and disadvantages of various network.
	35.04 Describe the function of various network devices.
	35.05 Describe the difference between the internet and intranet.
	35.06 Compare and contrast IP Version 6 and IP Version 4.
	35.07 Compare and contrast the different network types.
	35.08 Compare and contrast various implementation models.
	35.09 Describe an Ethernet network and the use of CSMA\CD.
36.0	Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact. The student will be able to:
	36.01 Identify, troubleshoot and propose solutions for configuration problems.
	36.02 Identify, troubleshoot and propose solutions for software problems.
	36.03 Identify, troubleshoot and propose solutions for hardware malfunctions.
	36.04 Identify, troubleshoot and propose solutions for network malfunctions.
	36.05 Plan and implement a system upgrade and downgrade.
	36.06 Evaluate data recovery using various techniques.
	36.07 Organize and perform system maintenance activities.
	36.08 Demonstrate corporate interaction proficiency.
37.0	Demonstrate knowledge of presentation production issues. The student will be able to:
	37.01 Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedure.
	37.02 Demonstrate an understanding of graphic and other file and knowledge of image size when scanning and saving files for use in different presentation types.

CTE Standards and Benchmarks	
	37.03 Identify display device connectors and types.
	37.04 Define refresh rate, resolution, multi-monitor and Degauss.
	37.05 Demonstrate knowledge of presentation vocabulary/terms.
	37.06 Compare and contrast and utilize various audio/video output solutions and devices.
	37.07 Compare and contrast removable storage.
38.0	Demonstrate proficiency communicating over the Internet. The student will be able to:
	38.01 Display understanding of how Internet Service Providers (ISP) operates and what role they play in enabling users to connect to the Internet.
	38.02 Explain how the Internet works and how documents are connected and transferred.
	38.03 Configure an email client for SMTP and POP3 servers, including port assignment.
	38.04 Explain how the primary modes of Internet communication are used.
39.0	Demonstrate proficiency in troubleshooting, repair and maintenance of computers. – The student will be able to:
	39.01 Determine the troubleshooting methods and tools for printers.
	39.02 Explain and interpret common laptop issues and basic troubleshooting methods.
	39.03 Integrate common preventative maintenance techniques.
40.0	Demonstrate proficiency in the basic principles of security concepts and technologies. The student will be able to:
	40.01 Evaluate encryption technologies, software firewall, authentication technologies, and data security.
	40.02 Summarize the following security features.
41.0	Demonstrate proficiency in operational procedures as they relate to computer equipment and components. The student will be able to:
	41.01 Compare and contrast ESD, EMI, RFI, and electrical safety.
	41.02 Demonstrate proficiency in the use of state regulations for hazardous materials.
42.0	Demonstrate proficiency in information technology tools. The student will be able to:
	42.01 Use personal information management (PIM) applications to increase workplace efficiency.
	42.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	42.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	42.04 Employ collaborative/groupware applications to facilitate group work.
43.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The

CTE Standards and Benchmarks	
	student will be able to:
	43.01 Describe the nature and types of business organizations.
	43.02 Explain the effect of key organizational systems on performance and quality.
	43.03 List and describe quality control systems and/or practices common to the workplace.
	43.04 Explain the impact of the global economy on business organizations.
44.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	44.01 Evaluate and justify decisions based on ethical reasoning.
	44.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	44.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	44.04 Interpret and explain written organizational policies and procedures.

Florida Department of Education
Student Performance Standards

Course Title: **Cloud Principles**
Course Number: **9003550**
Course Credit: **1**

CTE Standards and Benchmarks	
45.0	Evaluate and analyze concepts used in cloud computing. The student will be able to:
45.01	Demonstrate an understanding of the evolution of cloud computing.
45.02	Describe the four main deployment models for cloud computing, public, private, community, and hybrid.
45.03	Describe the three main service models for cloud computing (SaaS, PaaS, and IaaS).
45.04	Describe cloud computing roles (cloud computing customer, cloud service provider and cloud service partner).
45.05	Describe cloud characteristics (on-demand self-service, broad network access, multi-tenancy, rapid elasticity).
45.06	Describe the role of the Internet and Building Block Technologies of virtualization, storage, networking and databases in cloud computing.
45.07	Understand and identify managed services in cloud computing.
46.0	Identify the components of cloud-based services. The student will be able to:
46.01	Demonstrate proficiency in accessing web applications through web browser.
46.02	Describe, identify and use thin clients to complete business tasks.
46.03	Describe, identify and use thick clients to complete business tasks.
46.04	Demonstrate an awareness of application hosting.
46.05	Demonstrate an awareness of multipurpose architecture.
47.0	Evaluate cloud-based services. The student will be able to:
47.01	Understand the economics of different cloud-based models for an organization.
47.02	Compare and contrast cloud-based services used in industry.
47.03	Identify the impacts to current and future staffing and operational needs.
47.04	Evaluate performance of cloud-based solutions using performance indicators.
48.0	Use cloud-based services. The student will be able to:
48.01	Compare and contrast outsourcing and cloud computing as alternatives for business.

CTE Standards and Benchmarks	
	48.02 Identify and use cloud-based services to improve productivity.
	48.03 Compare and contrast cloud-based services for consumer and business.
	48.04 Use cloud-based services to perform collaboration online.
	48.05 Demonstrate an awareness of the user experience in using a cloud-based service as compared to traditional business model.
49.0	Evaluate and analyze techniques and methods of cloud deployment, and design principles of secure cloud computing. The student will be able to:
	49.01 Demonstrate an awareness of networking for cloud-based solutions.
	49.02 Demonstrate an awareness of the role of automation and self-service in regard to cloud-based solutions & cloud security data lifecycle.
	49.03 Demonstrate understanding of the cloud-based business continuity/ disaster recovery planning.
	49.04 Demonstrate an awareness of deployment and management of internal and external cloud services cost benefit analysis to complete business task.
	49.05 Demonstrate an awareness of the role of standardization in cloud-based solutions.
	49.06 Demonstrate an awareness of the impact of time to market and distribution over the Internet in cloud deployment.
50.0	Evaluate the risks of cloud-based systems. The student will be able to:
	50.01 Identify and evaluate compliance and legal risks relating to software and vendors in cloud-based systems.
	50.02 Demonstrate an understanding of user privacy rights and privacy risks in cloud-based systems.
	50.03 Demonstrate understanding of system/subsystem product certifications (common criteria, FIPS I 40-2).
	50.04 Demonstrate understanding of the role of vendors, dependencies, and functional risk requirements in cloud-based solutions (portability, interoperability, vendor lock-in).
	50.05 Demonstrate an understating of the risks of hardware independence.
	50.06 Identify the main aspects of identity management.
51.0	Demonstrate an awareness of cloud implementation security concepts. The student will be able to:
	51.01 Describe the risk of connecting a local cloud network to the public Internet (encryption, in motion, at rest, key management).
	51.02 Describe the use of a virtual private network access to local area network.
	51.03 Identify and describe the components of cloud environment, data and media sanitization (overwriting, cryptographic erasure and destruction).
	51.04 Demonstrate an understanding of networking topologies network security in cloud environment.
	51.05 Demonstrate an understanding of servers, switches, and routers in cloud-based architecture virtualization security (hypervisor security) and common threats.

CTE Standards and Benchmarks
51.06 Demonstrate an understanding of the role of the datacenter in cloud-based architecture.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Digital Media Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9005100
CIP Number	0509070201
Grade Level	9-12
Program Length	5 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1142 – Network and Computer Systems Administrators
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in technical digital media positions in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills.

The content includes but is not limited to practical experiences in the implementation, management, and maintenance of advanced telecommunication environments associated with the creation, packaging, and delivery of digital media.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of five (5) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
9005110	Digital Media Fundamentals	BUS ED 1 @2 DIGI MEDIA 7G INFO TECH 7G	1 credit	15-1142	3	CT
9005120	Digital Media Production Systems		1 credit		3	CT
9005130	Digital Media Delivery Systems		1 credit		3	CT
9005140	Advanced Digital Media Systems		1 credit		3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Describe characteristics of digital media relative to format, standards, encoding schemes, and origin.
11.0 Compare and contrast various forms of digital media delivery systems.
12.0 Demonstrate an understanding of handling equipment, recording video and audio, exporting files and editing projects.
13.0 Demonstrate an understanding of the characteristics, development medium, and technical aspects of digital audio.
14.0 Create animation in digital media that enhances production.
15.0 Perform safety skills while performing or recording on set.
16.0 Apply appropriate lighting for location and/or set productions.
17.0 Operate a video camera.
18.0 Record, mix and edit audio resources.
19.0 Shoot Studio and/or location footage.
20.0 Design and generate graphic elements.
21.0 Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital video.
22.0 Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital audio.
23.0 Apply industry standard workflow management methods applicable to the integration and synchronization of audio and video into a single digital media product.
24.0 Apply industry standard asset management methods applicable to development of a digital media product.
25.0 Explain the importance of calibration in the production of digital media and the means by which it is accomplished.
26.0 Demonstrate proficiency in producing a digital media product for delivery for both televised and online streaming media.
27.0 Demonstrate proficiency in producing a digital media product for delivery using an Internet-based on-demand system (e.g., VOD, IPTV).
28.0 Demonstrate proficiency in producing a digital media product for delivery using an Internet-based streaming system.
29.0 Demonstrate proficiency in producing a digital media product for delivery using an Internet-based system featuring multi-point presence.
30.0 Demonstrate proficiency in producing a digital media product for delivery using satellite delivery systems.
31.0 Describe the evolution, role, and characteristics of a Content Distribution Network (CDN) for delivering digital media to Internet points.

32.0 Demonstrate an understanding of Internet Protocol Television (IPTV) systems, their types, applications, and implementation issues.
33.0 Successfully plan out and produce a professional portfolio showcasing mastery of multimedia production and self-marketing.
34.0 Utilize best practices involving advanced professional grade equipment.
35.0 Use innovative means and perceptual understanding to communicate through varied content, media and digital art techniques.
36.0 Develop competence and dexterity, through the use of processes, tools and techniques for various media.
37.0 Examine career opportunities in the Digital Media Field to determine requisite skills, qualifications, supply-and-demand, market location and potential earnings.
38.0 Demonstrate professional organizational skills to influence sequential process when producing multimedia.
39.0 Demonstrate professional interview skills.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Digital Media Fundamentals**
Course Number: **9005110**
Course Credit: **1**

Course Description:

This course introduces students to the essential concepts, components, terminology, and knowledge about digital media, software applications, and delivery systems.

CTE Standards and Benchmarks	
10.0	Describe characteristics of digital media relative to format, standards, encoding schemes, and origin. The student will be able to:
10.01	Determine the meaning of symbols, key terms, and other domain-specific words and phrases.
10.02	Identify and differentiate the appropriate use of digital media formats based on standard industry practices.
10.03	Identify and differentiate the appropriate use of encoding schemes based on project needs.
10.04	Identify the difference between digital media source files and digital media delivery systems.
11.0	Compare and contrast various forms of digital media delivery systems. The student will be able to:
11.01	Identify the differences between fixed digital media formats and digital media streaming.
11.02	Identify the various forms of digital media content distribution.
11.03	Describe the development of digital media technology as it pertains to digital signage.
11.04	Describe the impact of mobile and Wi-Fi technologies on the digital media development industry.
12.0	Demonstrate an understanding of handling equipment, recording video and audio, exporting files and editing projects. The student will be able to:
12.01	Identify digital image file types and their appropriate uses.
12.02	Compare and contrast the similarities and differences between Standard Definition and High Definition recordings.
12.03	Describe and apply the characteristics of digital video.
12.04	Identify and describe the various application platforms used in digital video development.
12.05	Create a video production that meets the industry standards of production.
13.0	Demonstrate an understanding of the characteristics, development medium, and technical aspects of digital audio. The student will be able to:
13.01	Identify and describe the fundamental aspects of sound theory.

CTE Standards and Benchmarks	
	13.02 Compare and contrast the similarities and differences between various audio recordings.
	13.03 Describe the characteristics of digital audio.
	13.04 Identify and describe the various application platforms used in digital audio recording and editing.
	13.05 Enhance storytelling using sound effects.
	13.06 Capture and edit original audio to be utilized with in class video production projects.
14.0	Create animation in digital media that enhances production. The student will be able to:
	14.01 Describe the process of developing animations and identify the industry standard platforms used in their creation.
	14.02 Describe the similarities and differences as well as industry standard platforms used in the development of 2D and 3D graphics.
	14.03 Identify and describe the challenges in developing and deploying digital media content.
	14.04 Identify the components and characteristics of motion that make up an animation.
	14.05 Create animations within production.
	14.06 Produce storyboarding, production plans (GANTT CHARTS) and playable rough cuts.
15.0	Perform safety skills while performing or recording on set. The student will be able to:
	15.01 Perform proper care of equipment.
	15.02 Demonstrate appropriate use of equipment in an efficient manner.
	15.03 Demonstrate awareness of appropriate ergonomics.
	15.04 Demonstrate safe ways to create action on set.
	15.05 Apply ethical practices.
16.0	Apply appropriate lighting for location and/or set productions. The student will be able to:
	16.01 Determine appropriate lighting needs for production settings.
	16.02 Identify locations and studio lighting types, method of use and application.
	16.03 Use lighting equipment according to industry safety standards.
17.0	Operate a video camera. The student will be able to:
	17.01 Use current industry standard production video equipment.
	17.02 Operate camera in studio and location (field) production environments.
	17.03 Align camera for studio production.

CTE Standards and Benchmarks	
	17.04 Demonstrate appropriate framing for both SDTV and HDTV.
	17.05 Operate (CCU) Camera Control Uni.
18.0	Record, mix and edit audio resources. The student will be able to:
	18.01 Identify and select microphones for production needs.
	18.02 Determine optimal microphone placement.
	18.03 Establish appropriate recording conditions.
	18.04 Set up audio recording equipment.
	18.05 Perform appropriate pre-production check of production equipment.
	18.06 Record location sound.
	18.07 Record studio live sound.
	18.08 Perform basic routine, preventative and repair maintenance on video equipment.
	18.09 Define the various recording formats and media.
	18.10 Define appropriate digital compression and signal (file) types.
	18.11 Perform sound edits and enhancements.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Media Production Systems**
Course Number: **9005120**
Course Credit: **1**

Course Description:

This course introduces students to the digital video and audio authoring environments, equipment, and software applications. Content includes management aspects of creating, saving, and distributing digital assets.

CTE Standards and Benchmarks	
19.0	Shoot studio and/or location footage. The student will be able to:
19.01	Plan a shot to obtain required action/footage.
19.02	Demonstrate appropriate shot sequences, transitions and post production (edit) effects.
19.03	Control camera movement to obtain required effects.
19.04	Control lens, focal length, aperture and exposure to obtain required effects.
19.05	Set up camera and recording equipment sequence.
20.0	Design and generate graphic elements. The student will be able to:
20.01	Determine the graphic requirements for a production.
20.02	Operate graphic production software.
20.03	Produce broadcast graphic elements for titling, credits and graphic transitions.
20.04	Determine the special effects need for a production.
20.05	Set up and operate character generator equipment and software.
20.06	Generate appropriate special effects and animated elements for a production.
20.07	Demonstrate an understanding of graphic image types, file formats, and technical requirements for a production.
20.08	Use image editing (bit mapped) software.
20.09	Edit graphics into the program or segment.
20.10	Demonstrate an ability to use type, color, composition and graphic elements for a specific production effect.
20.11	Demonstrate an ability to use different aspect ratios as needed for SDTV and HDTV.

CTE Standards and Benchmarks	
	20.12 Identify and describe the standard practices for retrieving digital media assets both on local and remote work stations/networks.
	20.13 Describe the standard practices for establishing digital asset security.
	20.14 Describe the purpose and function of metadata as it pertains to the management of digital assets.
21.0	Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital video. The student will be able to:
	21.01 Produce video files according to industry standard specifications using digital media development hardware and software applications.
	21.02 Identify and incorporate the appropriate use of digital video encoding based on industry standard practices.
	21.03 Identify the various tools and procedures utilized in the conversion of digital media file types.
	21.04 Demonstrate proficiency in the utilization of standard video production equipment.
	21.05 Demonstrate proficiency in the connectivity and configuration of digital video equipment.
	21.06 Identify and troubleshoot lighting issues as they pertain to the recording of digital video as well as describe common industry practices in the staging of light sources.
22.0	Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital audio. The student will be able to:
	22.01 Produce audio files according to industry standard specifications using digital media development hardware and software applications.
	22.02 Demonstrate proficiency in the utilization of standard audio production equipment.
	22.03 Demonstrate proficiency in the connectivity and configuration of digital audio equipment.
23.0	Apply industry standard workflow management methods applicable to the integration and synchronization of audio and video into a single digital media product. The student will be able to:
	23.01 Describe the various media integration systems and their appropriate uses in the development of digital media.
	23.02 Identify and describe the importance of version control in digital asset management.
	23.03 Identify and describe the various forms of digital audio/video synchronization and the tools and techniques used to sync digital audio and video.
	23.04 Successfully operate digital audio/video devices simultaneously in order to produce HD quality media to synchronize assets for post-production.
24.0	Apply industry standard asset management methods applicable to development of a digital media product. The student will be able to:
	24.01 Identify and describe the standard practices for storing and archiving digital media assets.
	24.02 Successfully apply and enhance upon industry standard practices for storing and archiving digital media assets.
	24.03 Identify and describe the standard practices for retrieving digital media assets both on local and remote work stations/networks.
	24.04 Describe the standard practices for establishing digital asset security.

CTE Standards and Benchmarks	
	24.05 Describe the purpose and function of metadata as it pertains to the management of digital assets.
25.0	Explain the importance of calibration in the production of digital media and the means by which it is accomplished. The student will be able to:
	25.01 Identify the necessity and effects of calibration on various digital media systems.
	25.02 Identify standard practices in calibrating digital media production equipment.
	25.03 Use lighting for effect to control mood and impact in production settings.
	25.04 Use studio lighting master control equipment.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Media Delivery Systems**
Course Number: **9005130**
Course Credit: **1**

Course Description:

This course introduces students to the digital video and audio delivery media and associated protocols. Content includes technical aspects of evolving and emerging technologies used in the delivery of digital content.

CTE Standards and Benchmarks	
26.0	Demonstrate proficiency in producing a digital media product for delivery for both televised and online streaming media. The student will be able to:
26.01	Identify and describe the various physical and application formats for (DVD) media technology.
26.02	Identify and describe the various (DVD) physical outputs for media players.
26.03	Identify the features and specifications of (DVD) media and the (DVD) format.
26.04	Identify and describe the (DVD) media industry specification (red book standard).
26.05	Identify and describe the various coding mechanisms utilized in the creation of (DVD) media.
26.06	Identify and describe standard copy protection practices in (DVD) media creation.
26.07	Use standard (DVD) authoring / editing systems in the creation of (DVD) media.
26.08	Identify and describe the appropriate use of standard television formats (PAL & NTSC).
26.09	Demonstrate an awareness of the issues in quality when compressing digital media.
27.0	Demonstrate proficiency in producing a digital media product for delivery using an Internet-based on-demand system (e.g., VOD, IPTV). The student will be able to:
27.01	Develop digital media in the appropriate specified format for delivery on On-Demand Systems.
27.02	Develop digital media in the appropriate specified format for delivery on Video on demand (VOD) Systems.
27.03	Develop digital media in the appropriate specified format for delivery on IP Television (IPTV).
28.0	Demonstrate proficiency in producing a digital media product for delivery using an Internet-based streaming system. The student will be able to:
28.01	Develop digital media in the appropriate specified format for delivery on On-Demand Systems.
28.02	Develop digital media in the appropriate specified format for delivery on Video on demand (VOD) Systems.

CTE Standards and Benchmarks	
	28.03 Develop digital media in the appropriate specified format for delivery on IP Television (IPTV).
	28.04 Develop digital media in the appropriate specified format for delivery on Grid Casting systems.
29.0	Demonstrate proficiency in producing a digital media product for delivery using an Internet-based system featuring multi-point presence. The student will be able to:
	29.01 Demonstrate an awareness of the tools and practices used in establishing multiple points of presence.
	29.02 Demonstrate an awareness of design constraints and attributes as they pertain to producing digital media for delivery on internet-based systems.
	29.03 Demonstrate an awareness of communication channels and considerations as they pertain to producing digital media for delivery on internet-based systems.
30.0	Demonstrate proficiency in producing a digital media product for delivery using satellite delivery systems. The student will be able to:
	30.01 Identify industry applications utilized in producing a digital media product for delivery using satellite delivery systems.
	30.02 Identify current technologies and capabilities used in the production of a digital media product for delivery using satellite delivery systems.
	30.03 Describe the current limitations (e.g., latency) of delivering digital media via satellite delivery systems.
	30.04 Identify and describe common issues in delivering digital media via simulcast systems.
	30.05 Identify and describe the process of delivering digital media via multicast systems.
31.0	Describe the evolution, role, and characteristics of a Content Distribution Network (CDN) for delivering digital media to Internet points. The student will be able to:
	31.01 Describe content networking techniques as they pertain to the delivering of digital media to internet points.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Digital Media Systems**
Course Number: **9005140**
Course Credit: **1**

Course Description:

This course covers advanced technologies and environments typical in robust digital media applications, including live and pre-recorded scenarios.

CTE Standards and Benchmarks	
32.0	Demonstrate an understanding of Internet Protocol Television (IPTV) systems, their types, applications, and implementation issues. The student will be able to:
32.01	Demonstrate an understanding of converged services and their application to Internet Protocol Television (IPTV).
32.02	Compare and contrast live versus stored media systems.
32.03	Demonstrate an understanding of Internet Protocol Television (IPTV) applications and delivery systems.
32.04	Demonstrate an understanding of common issues that pertain to the development of digital media for distribution over Internet Protocol Television (IPTV) systems.
33.0	Successfully plan out and produce a professional portfolio showcasing mastery of multimedia production and self-marketing. The student will be able to:
33.01	Showcase a high level of creative independence in producing multimedia content that focuses on the individual student's strengths and build upon any skills that may require additional practice throughout the Portfolio development.
33.02	Student will both document and demonstrate both successful and unsuccessful progress a throughout their portfolio development by use of a Production Schedule or GANTT CHART.
33.03	Write, direct and produce an amateur short film. This work will be continuously progressive until a Portfolio deadline is designated.
33.04	Write, direct and produce an amateur commercial advertisement. This work will be continuously progressive until Portfolio deadline is designated.
33.05	Write, direct and produce an amateur Visual Postcard. This work will be continuously progressive until Portfolio deadline is designated
33.06	Write, direct and produce an amateur Motion Graphics based tutorial. This work will be continuously progressive until Portfolio deadline is designated.
34.0	Utilize best practices involving advanced professional grade equipment. The student will be able to:
34.01	Pack and transport equipment.
34.02	Identify and dismantle/assemble equipment.
34.03	Locate, scout and obtain appropriate on site permission.

CTE Standards and Benchmarks	
	34.04 Use model release form documents.
	34.05 Scout locations for proper electrical outlets.
	34.06 Plan, coordinate and manage a production GANTT Chart
	34.07 Define specific dates for multiple video production projects.
	34.08 Determine post-production requirements.
	34.09 Coordinate post-production values.
	34.10 Identify and attempt to resolve production issues during post-production.
	34.11 Practice leadership skills.
	34.12 Manage crew and staff during pre-planning and production.
	34.13 Present project proposals including script, storyboards and shot lists.
	34.14 Delegate and assign tasks to members during all phases of production.
	34.15 Apply advanced color correction techniques to film.
	34.16 Demonstrate and apply primary practice of marketing sales techniques.
35.0	Use innovative means and perceptual understanding to communicate through varied content, media and digital art techniques. The student will be able to:
	35.01 Showcase a high level of creative independence in producing multimedia content that focuses on the individual student's strengths and build upon any skills that may require additional practice throughout Portfolio development.
	35.02 Students will both document and demonstrate both successful and unsuccessful progress throughout their portfolio development by use of a Production Schedule or GANNT CHART.
	35.03 Write, direct and produce an amateur short film. This work will be continuously progressive until a Portfolio deadline is designated.
	35.04 Write, direct and produce an amateur commercial advertisement. This work will be continuously progressive until Portfolio deadline is designated.
	35.05 Write, direct and produce an amateur Visual Postcard. This work will be continuously progressive until Portfolio deadline is designated
	35.06 Write, direct and produce an amateur Motion Graphics based tutorial. This work will be continuously progressive until Portfolio deadline is designated
	35.07 Demonstrate strong use of graphical design programs (Photoshop, Illustrator) to edit, enhance and properly choose formats for placement and use in Premiere, Final Cut, Motion or After Effects.
36.0	Develop competence and dexterity, through practice, in the use of processes, tools and techniques for various media. The student will be able to:
	36.01 Utilize best practices involving advanced professional grade equipment.
	36.02 Pack and transport equipment.

CTE Standards and Benchmarks	
	36.03 Identify and dismantle/assemble equipment.
	36.04 Use model release form documents.
	36.05 Locate, scout and obtain appropriate on site permission as needed.
	36.06 Define specific dates for multiple video production projects.
	36.07 Coordinate post-production values.
	36.08 Identify and attempt to resolve production issues during post-production.
	36.09 Present project proposals including script, storyboards and shot lists.
	36.10 Delegate and assign tasks to members during all phases of production.
	36.11 Manage crew and staff during pre-planning and production.
37.0	Examine career opportunities in the Digital Media field to determine requisite skills, qualifications, supply-and-demand, market location, and potential earning. The student will be able to:
	37.01 Demonstrate and apply primary practice of marketing sales techniques.
	37.02 Identify, demonstrate and practice modern day online and televised marketing techniques.
	37.03 Research average salary range for various Digital Media careers.
	37.04 Research existing Digital Media careers and determine specified skills and qualifications.
38.0	Demonstrate professional organizational skills to influence sequential process when producing multimedia. The student will be able to:
	38.01 Properly save and export multiple formats of video, audio and images from specified editing programs for use in cross platform devices and software.
	38.02 Use PC/MAC operating system to create multiple directories specified to the types of media being imported or used for their projects.
	38.03 Identify known software issues and determine solutions.
	38.04 Understand updated software and its system requirements.
39.0	Demonstrate professional interview skills. The student will be able to:
	39.01 Showcase the value of their own skills during mock interviews.
	39.02 Be able to present works to others and openly discuss the purpose of its value.
	39.03 Initiate and participate in group discussions related to others progress and offer intuitive solutions as well as accepting constructive criticism and conforming to new processes.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Modeling and Simulation**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9005200
CIP Number	0511080401
Grade Level	9-12
Program Length	5 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 15-1132 – Software Developers, Applications 15-1131– Computer Programmer
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The Modeling and Simulation program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster and the expansive employment opportunities in the field of Modeling and Simulation. This course provides technical skill proficiency and includes competency-based applied learning through the use of hands-on labs and the development of a multi-year portfolio. Students will build academic knowledge, enhance higher-order reasoning and problem-solving skills, develop leadership and collaboration abilities and refine general employability and occupation-specific skills.

The content includes but is not limited to practical experiences in modeling and simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, prototype development, production processes and implementation challenges. Science, Computer Programming, Math, 2D and 3D Art are embedded throughout the program to emphasize the relationship between these areas and the

field of Modeling and Simulation. To further enrich this course sequence it is recommended students take a sequence of electives in either visual arts, computer arts, or digital arts including but not limited to Computer Programming, Web Design, 2D and 3D Art, Gaming and Animation, Robotics and/or Geospatial/Geographic Information Systems Technology.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of five (5) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1199	2	CT
9005210	Modeling and Simulation Foundations	COMPU SCI 6 ENG&TEC ED1@2 TEC ED 1 @2 ENG 7G ENG TECH 7G INFO TECH 7G COMP PROG 7G ROBOTICS 7G BUS ED 1 @2	1 credit	15-1199	2	CT
9005220	Modeling and Simulation Design		1 credit	15-1199	2	CT
9005230	Modeling and Simulation Applications		1 credit	15-1131	3	CT
9005240	Modeling and Simulation Prototyping and Innovation		1 credit	15-1131	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Program Recommendations

The Modeling and Simulation program lends itself to integration of the core academic subjects of language arts, math, science, visual arts, and social studies into project activities. It is through a balanced and integrated curriculum that students attain the attitudes, skills, and knowledge needed to compete successfully in today's work force. Implementation models that encourage curriculum integration provide a strong foundation for cross content curricular instruction. Ideally, Modeling and Simulation teachers and cooperating teachers would be provided with collaborative planning time and would work jointly to achieve the goals of the program.

This program emphasizes the development of technical abilities as well as ethical and societal awareness necessary to function in a highly technological society. The use of cooperative learning groups is recommended. By learning and practicing group process skills, students will be prepared to work collaboratively in real work situations. Program graduates will develop enhanced self-esteem as well as the problem solving and teamwork skills necessary to succeed in careers and postsecondary education.

The Modeling and Simulation program places a strong emphasis on workplace learning. Job shadowing and mentoring experiences with Modeling and Simulation professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge.
11.0 Demonstrate information fluency using emerging research techniques and technology.
12.0 Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to modeling and simulation.
13.0 Explain intelligent systems as they relate to modeling, simulation and data analysis.
14.0 Develop an understanding of programming languages as they relate to modeling and simulation.
15.0 Demonstrate knowledge of different operating systems.
16.0 Explore software evolution and lifecycle as it relates to modeling and simulation.
17.0 Demonstrate an understanding of visual modeling in relation to the production process.
18.0 Understand the role of texture artists in relation to the production process.
19.0 Demonstrate knowledge of basic materials and textures.
20.0 Demonstrate knowledge of basic lighting.
21.0 Explain visual simulation.
22.0 Explain distributed simulation.
23.0 Explain environmental models.
24.0 Use visual modeling techniques and software to create an environmental model.
25.0 Understand the production process of modeling and simulation for various application domains.
26.0 Demonstrate knowledge of basic animation.
27.0 Demonstrate knowledge of basic 3D rendering.
28.0 Demonstrate basic understanding of modeling principles.
29.0 Analyze model fidelity as related to modeling and simulation techniques.
30.0 Explain object models.
31.0 Demonstrate an understanding of mathematical modeling in relation to the design process.
32.0 Explain agent-based simulation.
33.0 Demonstrate knowledge of video editing software.

34.0 Incorporate audio assets into a modeling and simulation engine.
35.0 Utilize basic audio production techniques, sound construction, and editing techniques as related to modeling and simulation.
36.0 Apply industry standards for 3D animation software and user interface to create 3D basic and complex models.
37.0 Demonstrate knowledge of rigging.
38.0 Demonstrate knowledge of basic character setup.
39.0 Demonstrate knowledge of motion capture systems.
40.0 Use the production process and relevant modeling and simulation techniques and software to design simple 3D simulation.
41.0 Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices.
42.0 Build a simple scenario for experimentation or training.
43.0 Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation.
44.0 Demonstrate an understanding of 3D modeling and simulation.
45.0 Understand systems engineering for simulators.
46.0 Use real time technology to model and simulate environments.
47.0 Demonstrate an understanding of underlying principles of numerical analysis and how it relates to modeling and simulation.
48.0 Analyze numerical characteristics of data sets to describe patterns and departure from patterns, using statistics for various distributions.
49.0 Use probabilities to plan and conduct an experiment that will address control, randomization and measurement of experimental error.
50.0 Test programs related to modeling and simulation.
51.0 Perform program maintenance to troubleshoot and optimize code.
52.0 Plan program design using object-oriented programming (OOP) for modeling and simulation.
53.0 Demonstrate knowledge of polygon and non-uniform rational b-splines (NURBS) modeling.
54.0 Demonstrate knowledge of animation principles as it relates to the underlying physics of modeling.
55.0 Use the production process and relevant modeling and simulation techniques and software to render a complex 3D simulation.
56.0 Explain and utilize project management and logistics to create and develop 3D modeling and simulation products.
57.0 Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets.
58.0 Apply the principles of entrepreneurism to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production.
59.0 Use innovative technologies to create prototypes of models.
60.0 Create and design vector or bitmap art reference to develop a 3D modeling texture map to build a model for simulation.
61.0 Demonstrate the use of experimental and engineering design techniques to produce real world or industry simulations.
62.0 Demonstrate an understanding of underlying principles of discreet event simulation and how it relates to modeling and simulation.
63.0 Implement multimedia programming as it relates to modeling and simulation using a physics engine.
64.0 Use innovative technologies to create prototypes of models.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Modeling and Simulation Foundations**
Course Number: **9005210**
Course Credit: **1**

Course Description:

This course provides an overview of the development and expansion of the field of Modeling and Simulation and its impact on society and industry. Strategies, processes and methods for conceptualizing modeling and simulation are introduced to serve as a foundation to cultivate interest and introduce technology skills and knowledge necessary for careers in modeling and simulation.

Hands-on activities using an entry-level modeling and simulation development tool (e.g., Auto Desk, Solid Works or other comparable software) should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the creation of a visual model to aide in the development of a professional portfolio.**

CTE Standards and Benchmarks	
10.0	Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge. The student will be able to:
10.01	Define and explain essential modeling and simulation terms and concepts to include Live-Virtual-Constructive simulations.
10.02	Identify disciplines which use modeling and simulation tools and discuss their real world applications.
10.03	Identify modeling and simulation related careers and the educational and professional requirements for various fields.
10.04	Compare and contrast the central modeling and simulation concepts and careers.
10.05	Explain the past, present, and future importance of modeling and simulation.
10.06	Compare and Contrast applications of models and analysis across a spectrum of applications in addition to human in the loop.
11.0	Demonstrate information fluency using emerging research techniques and technology. The student will be able to:
11.01	Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, augmented reality, networking).
11.02	Analyze internet safety issues and practice procedures for complying with acceptable use standards.
11.03	Use technology tools to collaborate and generate a deliverable product.
11.04	Develop and display an electronic portfolio.
11.05	Demonstrate research skills using browsers, search engines, directories, and databases.
11.06	Create and evaluate a list of materials found online for relevance, appropriateness and bias.

CTE Standards and Benchmarks	
	11.07 Create and communicate a multimedia presentation, including text, sound, and graphics as related to modeling and simulation concepts.
	11.08 Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, Bing).
	11.09 Identify effective Boolean search strategies.
	11.10 Correlate the use of social media in the field of modeling and simulation for a variety of purposes.
	11.11 Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, pdf).
12.0	Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to modeling and simulation. The student will be able to:
	12.01 Explain how information technology and modeling and simulation impact the operation and management of business and society.
	12.02 Explain the emergence of e-commerce and e-government and the potential impact on business and society.
	12.03 Trace the evolution of the Internet from its inception to the present and into the future.
	12.04 Analyze physical models and organize them conceptually based on their development and historical relevance.
	12.05 Use graphic technology to create a visualization of a historic simulator or synthetic environment that has evolved over time.
	12.06 Describe the evolution of the digital computer as it relates to modeling and simulation.
	12.07 Explain the need for and use of input devices and displays to design and create models and simulations.
	12.08 Demonstrate an understanding of storage management (e.g., hard drive, floppy disk) as it relates to creating and storing digital models and simulations.
	12.09 Identify the advantages and limitations of computer-generated models and simulation.
13.0	Explain intelligent systems as they relate to modeling, simulation and data analysis. The student will be able to:
	13.01 Define intelligent system.
	13.02 Explain and examine structured logic and semantics.
	13.03 Explain the use of intelligent systems.
	13.04 Examine programs using the elements of an intelligent system.
14.0	Develop an understanding of programming languages as they relate to modeling and simulation. The student will be able to:
	14.01 Explain the history of programming languages.
	14.02 Explain how compilers work.
	14.03 Identify the three types of programming design approaches (e.g., top-down, structured and object-oriented).
15.0	Demonstrate knowledge of different operating systems. The student will be able to:

CTE Standards and Benchmarks	
	15.01 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).
	15.02 Discuss the impact of RAM and ROM technology on the development of the modern computer operating systems and microcomputers.
	15.03 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	15.04 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, input/output (I/O) cards/ports, cabling).
	15.05 Explain the factors that can limit the simulation capabilities of personal computers.
16.0	Explore software evolution and lifecycle as it relates to modeling and simulation. The student will be able to:
	16.01 Explain software and hardware lifecycles in the systems engineering process and their steps.
	16.02 Demonstrate an understanding of the basic concepts of computer maintenance, upgrades and life cycle support.
17.0	Demonstrate an understanding of visual modeling in relation to the production process. The student will be able to:
	17.01 Explain visual modeling as a process.
	17.02 Explain the role of a modeler in visual modeling.
	17.03 Identify job titles associated with visual modeling.
	17.04 Explain the modeling production pipeline as it relates to visual modeling.
18.0	Understand the role of texture artists in relation to the production process. The student will be able to:
	18.01 Define texturing as a process.
	18.02 Define the role of texture artist.
	18.03 Identify job titles associated with texture artist.
	18.04 Identify texture creation in the production pipeline.
	18.05 Demonstrate knowledge of the difference between textures and shades.
19.0	Demonstrate knowledge of basic materials and textures. The student will be able to:
	19.01 Demonstrate an understanding of material and texture storage.
	19.02 Demonstrate an understanding of UV mapping.
	19.03 Apply textures to an object.
	19.04 Demonstrate an understanding of procedural shaders.
	19.05 Demonstrate an understanding of channels.
	19.06 Adjust the transparency, luminance, and reflection of a material.

CTE Standards and Benchmarks	
	19.07 Demonstrate an understanding of displacement maps.
	19.08 Demonstrate an understanding of bump maps.
	19.09 Demonstrate knowledge of material projections.
	19.10 Demonstrate an understanding of 3D painting.
	19.11 Understand how light affects the look of materials.
	19.12 Understand how camera angles can affect the look of materials.
20.0	Demonstrate knowledge of basic lighting. The student will be able to:
	20.01 Compare and contrast real lighting with 3D lighting.
	20.02 Demonstrate an understanding of 3 point lighting (key, fill, back).
	20.03 Demonstrate an understanding of low-key and high-key lighting.
	20.04 Use include/exclude commands to target light on objects.
	20.05 Demonstrate use of negative intensity.
21.0	Explain visual simulation. The student will be able to:
	21.01 Define and explain uses of visual simulation.
	21.02 Explain the use of visual simulation in distributed simulation.
	21.03 Explain the functions of the image generators, display and databases to support visual subsystem of simulators.
22.0	Explain distributed simulation. The student will be able to:
	22.01 Explain networking concepts.
	22.02 Explain distributed simulation protocols such as High Level Architecture (HLA).
	22.03 Explain the major components in a networked simulation or model.
23.0	Explain environmental models. The student will be able to:
	23.01 Explain the use of environmental modeling.
	23.02 Discuss how to model environmental effects.
	23.03 Discuss the effects of environmental simulations on related simulations.
	23.04 Examine environmental models available on the internet.
24.0	Use visual modeling techniques and software to create an environmental model. The student will be able to:
	24.01 Demonstrate information fluency by conducting research need to create an environmental model.

CTE Standards and Benchmarks	
24.02	Use modeling techniques and software to create a basic environmental model.
24.03	Communicate the relevance of the model and its impact on the real world.
24.04	Demonstrate understanding file formats and storage options.
24.05	Identify parts of the software interface (menus/palettes).
24.06	Demonstrate ability to use each of the basic tool sets.
24.07	Demonstrate ability to import, export and save images.
24.08	Demonstrate understanding of layers and channels.
24.09	Demonstrate understanding of filters, effects and plug-ins.
24.10	Demonstrate understanding of file presets.
24.11	Demonstrate ability to select portions of an image for manipulation.
24.12	Demonstrate ability to transform selections and images (crop, scale).
24.13	Demonstrate ability to color correct images (brightness, hue, contrast).
24.14	Demonstrate ability to use brushes for image creation and correction.
24.15	Understand non-destructive and destructive operations.
24.16	Demonstrate the ability to import, paint and export 3D objects.

Florida Department of Education
Student Performance Standards

Course Title: **Modeling and Simulation Design**
Course Number: **9005220**
Course Credit: **1**

Course Description:

This course explores the fundamental principles of modeling and simulation design and application including modeling principles, 3D software, problem analysis, problem solving and its implications for meeting the needs of industry and society.

Hands-on activities using an entry-level modeling and simulation development tool (e.g. Auto Desk, Solid Works or other comparable software) should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the creation of a simple 3D simulation design to aid in the development of a professional portfolio.**

CTE Standards and Benchmarks	
25.0	Understand the production process of modeling and simulation for various application domains. The student will be able to:
25.01	Identify the job titles associated with animation and simulation production.
25.02	Identify various tools and equipment used to produce 3D animation.
25.03	Understand speed and efficiency concepts.
25.04	Understand a production pipeline.
25.05	Identify the departments of an animation studio.
25.06	Understand the interrelationships among departments.
25.07	Understand basic communication concepts (verbal, memos, paperwork).
25.08	Identify the stages of production.
25.09	Understand studio terms and jargon.
25.10	Create and organize production paperwork into design/production documentation.
25.11	Identify target audiences, markets, and demographics.
25.12	Demonstrate ability to write a professionally formatted script.
25.13	Demonstrate ability to breakdown a script into production elements (cast, props).
25.14	Demonstrate understanding of visual storytelling and how storyboards are used during production.
26.0	Demonstrate knowledge of basic animation. The student will be able to:

CTE Standards and Benchmarks	
	26.01 Apply animation principles to object animation.
	26.02 Demonstrate an understanding of animation timelines.
	26.03 Demonstrate an understanding of key framing.
	26.04 Record and edit key frames.
	26.05 Demonstrate an understanding in the use of controllers.
	26.06 Render basic reference animation.
27.0	Demonstrate knowledge of basic 3D rendering. The student will be able to:
	27.01 Demonstrate an understanding of processor, hardware and software rendering techniques.
	27.02 Determine the final render format (size, codec, quality).
	27.03 Demonstrate an understanding of basic render settings.
	27.04 Select the range of frames to be rendered.
28.0	Demonstrate basic understanding of modeling principles. The student will be able to:
	28.01 Understand 3D construction theory.
	28.02 Demonstrate an understanding of primitives and parametric modeling.
	28.03 Demonstrate an understanding of non-uniform rational basis spline (NURBS), splines, and polygonal modeling.
	28.04 Demonstrate the ability to use reference images and files while modeling.
29.0	Analyze model fidelity as related to modeling and simulation techniques. The student will be able to:
	29.01 Define fidelity.
	29.02 Discuss the ramifications of model fidelity parameters and their variations.
	29.03 Select the proper level of fidelity to solve a given problem.
	29.04 Identify the rationale for selecting fidelity level.
	29.05 Adjust model fidelity parameters to meet output requirements.
30.0	Explain object models. The student will be able to:
	30.01 Describe objects using object oriented design (OOD).
	30.02 Distinguish between abstract and real objects.
	30.03 Explain why object oriented design is an effective programming paradigm.
	30.04 Describe the benefits of object oriented concepts.

CTE Standards and Benchmarks	
	30.05 Describe object oriented design (OOD) using pseudo-code or Unified Modeling Language (UML).
31.0	Demonstrate an understanding of mathematical modeling in relation to the design process. The student will be able to:
	31.01 Explain mathematical modeling as processes.
	31.02 Explain the role of modeler in mathematical modeling.
	31.03 Identify job titles associated with mathematical modeling.
	31.04 Explain the modeling production pipeline as it relates to mathematical modeling.
32.0	Explain agent-based simulation. The student will be able to:
	32.01 Demonstrate the concept of a distributed environment.
	32.02 Explore the architecture of agent-based simulation.
	32.03 Demonstrate the uses of agent-based modeling.
33.0	Demonstrate knowledge of video editing software. The student will be able to:
	33.01 Demonstrate understanding file formats and storage options.
	33.02 Identify parts of the software interface (menus/palettes).
	33.03 Demonstrate ability to use each of the basic tool sets.
	33.04 Demonstrate ability to import, export and save video.
	33.05 Demonstrate understanding of layers and compositing.
	33.06 Demonstrate understanding of filters, effects and plug-ins.
	33.07 Demonstrate understanding of file presets.
	33.08 Demonstrate understanding of rendering process.
	33.09 Demonstrate ability to transform video (crop, scale).
	33.10 Demonstrate ability to color correct images (brightness, hue, contrast).
	33.11 Demonstrate ability to use brushes for image creation and correction.
	33.12 Understand non-destructive and destructive operations.
	33.13 Demonstrate the compositing integration of rendered 3D animation with video.
34.0	Incorporate audio assets into modeling and simulation engine. The student will be able to:
	34.01 Describe the audio effects workflow.
	34.02 Explain audio codecs and formats used in game/simulation engines.

CTE Standards and Benchmarks	
	34.03 Import audio into the game/simulation engine.
	34.04 Use appropriate naming conventions for audio assets.
	34.05 Describe the use of 3D and surround sound.
	34.06 Apply knowledge of distance/spatial effects, including surround sound, in a game/simulation.
	34.07 Analyze the relationship of the audio environment to the visual environment.
35.0	Utilize basic audio production techniques, sound construction, and editing techniques as related to modeling and simulation. The student will be able to:
	35.01 Describe the use of digital recording decks and other digital storage devices.
	35.02 Describe the function and operation of digital audio workstations.
	35.03 Edit, cut, erase, and insert sound utilizing various digital production techniques.
	35.04 Perform digital noise reduction and noise extraction via spectral display.
	35.05 Survey and discuss the use of naming conventions and temp sounds.
	35.06 Demonstrate an understanding of various audio construction software.
	35.07 Analyze and discuss methods of matching sound effects to art assets.
	35.08 Identify and categorize commonly used technology sound engine integration equipment.
	35.09 Identify and discuss resources such as sound effects libraries.
	35.10 Examine methods of sound implementation and associated software.
	35.11 Explain how and why digital video may be integrated into a model or simulation design.
	35.12 Explain the roles and responsibilities of the sound design team.
36.0	Apply industry standards for 3D animation software and user interface to create 3D simple and complex models. The student will be able to:
	36.01 Identify the computer requirements for 3D animation software.
	36.02 Compare and contrast available 3D animation software.
	36.03 Identify available file formats and protocols.
	36.04 Explain the cinematic stage paradigm in 3D software.
	36.05 Demonstrate an understanding of naming conventions.
	36.06 Develop software and file backup plan.
	36.07 Identify common icons within the software.

CTE Standards and Benchmarks	
	36.08 Demonstrate use of keyboard shortcuts.
	36.09 Understand the use of a three-button mouse.
	36.10 Identify the main windows of a 3D program.
	36.11 Identify common window layouts.
	36.12 Identify tool icons within the software.
	36.13 Understand the significance of keyboard shortcut use and efficiency.
	36.14 Demonstrate an understanding of the Euclidean Geometry Model (x-y-z coordinate system).
	36.15 Demonstrate an understanding of attribute managers.
	36.16 Demonstrate an understanding of layers.
	36.17 Navigate the modeling window using pan, rotate, and zoom controls.
	36.18 Demonstrate knowledge of selection tools (lasso, loop).
	36.19 View objects in wireframe, Gourard shading, lines, boxes and modes.
	36.20 Demonstrate use of selection sets.
	36.21 Undo and redo an action within the program.
	36.22 Locate the help menu system.
37.0	Demonstrate knowledge of rigging. The student will be able to:
	37.01 Define rigging as a process.
	37.02 Define the role of rigger.
	37.03 Identify job titles associated with a rigger.
	37.04 Identify rigging creation in the production pipeline.
38.0	Demonstrate knowledge of basic character setup. The student will be able to:
	38.01 Compare and contrast rigging approaches and styles.
	38.02 Demonstrate an understanding of the rig as it relates to the model.
	38.03 Demonstrate an understanding of skeletal systems.
39.0	Demonstrate knowledge of motion capture systems. The student will be able to:
	39.01 Understand knowledge of the history of motion capture.
	39.02 Understand the awareness of emerging technologies in the industry.

CTE Standards and Benchmarks	
	39.03 Understand motion capture for 3D production.
40.0	Use the production process and relevant modeling and simulation techniques and software to design simple 3D simulation. The student will be able to:
	40.01 Demonstrate information fluency by conducting research need to design simple 3D simulation.
	40.02 Use the production process and relevant modeling and simulation techniques and software to design simple 3D simulation.
	40.03 Communicate the relevance of the simulation and its impact on the real world in areas such as medical, entertainment, military, education, transportation and manufacturing.

Florida Department of Education
Student Performance Standards

Course Title: **Modeling and Simulation Applications**
Course Number: **9005230**
Course Credit: **1**

Course Description:

This course focuses on the acquisition of technology skills for rendering a Modeling and Simulation product, including visual simulation and engineering logistics and implementation issues as they relate to Modeling and Simulation products.

Hands-on activities using an entry-level modeling and simulation development tool (e.g. Auto Desk, Solid Works or other comparable software) should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the rendering of a complex 3D simulation Design to aid in the development of a professional portfolio.**

CTE Standards and Benchmarks	
41.0	Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices. The student will be able to:
41.01	Demonstrate proficiency in the use of various software and visualization applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
42.0	Build a simulation for experimentation or training. The student will be able to:
42.01	Explain the importance of simulation building in simulations.
42.02	Identify the building blocks of simulations.
42.03	Design a storyboard for a simulation.
42.04	Build a simple simulation with a finite number of variables.
42.05	Identify the various components of a simulation.
42.06	Run a simulation application given specific parameters.
42.07	Explain verification and validation of a simulation.
42.08	Explore/develop building blocks of simulations.
42.09	Design a detailed storyboard for a simulation.
42.10	Build a simulation with a predetermined level of fidelity.
42.11	Describe the history of gaming and evolution of video games.
42.12	Design games using programming techniques.

CTE Standards and Benchmarks	
	42.13 Implement a simple game using appropriate software.
43.0	Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation. The student will be able to:
	43.01 Use proper attributes to develop a flowchart.
	43.02 Compare various types of studies (i.e., survey, observation, experiment).
	43.03 Identify and explain an experimental design process.
	43.04 Set realistic objectives for the experiment.
	43.05 Determine the appropriate response or output.
	43.06 Select process variables or design parameters (control factors), noise factors and the interactions among the process variables of interest.
	43.07 Perform experimental design execution.
	43.08 Check that the data are consistent with the experimental assumptions.
	43.09 Interpret and present results.
44.0	Demonstrate an understanding of 3D modeling and simulation. The student will be able to:
	44.01 Understand concepts of the transfer of training from the simulator to the parent system such as an aircraft.
	44.02 Understand mathematics of physics based real-time simulators.
	44.03 Describe components of visual systems (image generation, data bases and displays).
	44.04 Describe theory of motion/control loading simulation and cue synchronization.
	44.05 Describe simulator trainee station design, sensor simulation and instructor/operator station design.
45.0	Understand systems engineering for simulators. The student will be able to:
	45.01 Understand the systems engineering life cycle process and terminology.
	45.02 Understand the Systems Engineering life cycle process and terminology including the following: system requirements analysis, system design, hardware design and development, software design and development, system integration, configuration management, acceptance testing and contractor logistics support.
	45.03 Identify major milestones in the system life cycle such as preliminary/critical design reviews, establish function baseline, allocated baseline, product baseline and ready for training (RFT).
46.0	Use real time technology to model and simulate environments. The student will be able to:
	46.01 Identify simulator applications.
	46.02 Identify where team simulators would be appropriate.

CTE Standards and Benchmarks	
	46.03 Identify where individual simulators would be appropriate.
	46.04 Understand where and why networked simulators are used.
47.0	Demonstrate an understanding of underlying principles of numerical analysis and how it relates to modeling and simulation. The student will be able to:
	47.01 Apply logical reasoning skills to solve real-world problems through the development of mathematical models.
	47.02 Design a step-by-step plan (algorithm) to solve a given problem.
	47.03 Write program specifications that define the constraints of a given problem.
	47.04 Use a programmable calculator.
	47.05 Write an algorithm to solve mathematical problems using formulas, equations, and functions.
48.0	Analyze numerical characteristics of data sets to describe patterns and departure from patterns, using statistics for various distributions. The student will be able to:
	48.01 Define terminology associated with data collection, statistics and graphing.
	48.02 Differentiate between the various methods of data collection.
	48.03 Explain the uses of random number generators.
	48.04 Recognize various sources of bias in data collection.
	48.05 Prepare a sample data collection.
	48.06 Determine the numerical characteristics of a data set and analyze data.
	48.07 Interpret tables of statistics.
	48.08 Create bar charts and pie graphs with appropriate software.
	48.09 Analyze the data to solve a presented problem.
	48.10 Apply problem analysis using flowcharts or the Unified Modeling Language (UML).
49.0	Use probabilities to plan and conduct an experiment that will address control, randomization and measurement of experimental error. The student will be able to:
	49.01 Define and explain probability rules and event terminology.
	49.02 Identify events as complementary, dependent, independent, mutually exclusive or not mutually exclusive.
	49.03 Analyze categorical data using two-way tables to describe patterns and departure from patterns and to find marginal frequency and relative frequencies.
	49.04 Distinguish between empirical and theoretical probability.
	49.05 Calculate probabilities.

CTE Standards and Benchmarks	
	49.06 Explain the law of large numbers.
	49.07 Calculate probabilities using addition rules.
	49.08 Calculate probabilities using the multiplications rules.
	49.09 Define the Fundamental Counting Rule, Permutation, and Combination.
	49.10 Perform calculations using the Fundamental Counting Rule, Permutation and Combination.
	49.11 Distinguish when one would use a permutation and when one would use a combination.
	49.12 Define experimental terminology.
	49.13 Explain potential reasons for experimental error.
	49.14 Demonstrate an understanding of the principles of probability by performing a probability experiment within the classroom.
50.0	Test programs related to modeling and simulation. The student will be able to:
	50.01 Perform debugging activities.
	50.02 Evaluate program test results.
	50.03 Use trace routines of compilers to assist in program debugging.
	50.04 Compile and run programs.
	50.05 Create a stable code base.
	50.06 Develop data for use in program testing.
	50.07 Distinguish among the different types of program and design errors.
51.0	Perform program maintenance to troubleshoot and optimize code. The student will be able to:
	51.01 Review requested modification of programs and establish a plan of action.
	51.02 Design needed modifications in compliance with established standards.
	51.03 Code, test, and debug modifications prior to updating production code.
	51.04 Update production programs and documentation with changes.
	51.05 Analyze output to identify and annotate errors or enhancements.
52.0	Plan program design using object oriented programming (OOP) for modeling and simulation. The student will be able to:
	52.01 Formulate a plan to determine program specifications individually or in groups.
	52.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
	52.03 Design programs to solve problems using problem-solving strategies.

CTE Standards and Benchmarks	
53.0	Demonstrate knowledge of polygon and non-uniform rational b-splines (NURBS) modeling. The student will be able to:
53.01	Demonstrate an understanding of points, vertices, edges, and polygons.
53.02	Demonstrate an understanding of poly-count.
53.03	Demonstrate an understanding of primitives.
53.04	Define parametric primitives.
53.05	Locate an object's properties, attributes, and coordinates.
53.06	Demonstrate understanding of Non uniform rational b-splines (NURBS).
53.07	Demonstrate understanding of splines and generators (extrude, lathe, sweep).
53.08	Understand the use of hierarchy.
53.09	Demonstrate an understanding of Boolean objects.
53.10	Demonstrate an understanding of Null objects.
53.11	Demonstrate an understanding of scene management (hiding-unhiding).
53.12	Demonstrate an understanding of arrays.
54.0	Demonstrate knowledge of polygon modeling. The student will be able to:
54.01	Demonstrate an understanding of N-gons.
54.02	Demonstrate an understanding of subdivision.
54.03	Demonstrate basic polygon editing and manipulation.
54.04	Demonstrate knowledge of point management (location).
54.05	Demonstrate the ability to create polygonal models from points.
54.06	Demonstrate an understanding of cutting/division tools.
54.07	Demonstrate an understanding of extrudes.
54.08	Demonstrate an understanding of symmetry.
54.09	Demonstrate an understanding of hyper NURBS.
54.10	Demonstrate an understanding of basic deformers (bend, twist, melt).
54.11	Demonstrate an understanding of the principle of squash and stretch.
54.12	Demonstrate an understanding of the principle of anticipation.
54.13	Demonstrate an understanding of the principle of staging.

CTE Standards and Benchmarks	
	54.14 Demonstrate an understanding of the principle of straight ahead action and pose to pose.
	54.15 Demonstrate an understanding of the principle of follow through and overlapping action.
	54.16 Demonstrate an understanding of the principle of slow in and slow out.
	54.17 Demonstrate an understanding of the principle of arcs.
	54.18 Demonstrate an understanding of the principle of secondary action.
	54.19 Demonstrate an understanding of the principle of timing.
	54.20 Demonstrate an understanding of the principle of exaggeration.
	54.21 Demonstrate an understanding of the principle of solid drawing.
	54.22 Demonstrate an understanding of the principle of appeal.
55.0	Use the production process and relevant modeling and simulation techniques and software to render a complex 3D simulation. The student will be able to:
	55.01 Demonstrate information fluency by conducting research need to render a complex 3D simulation.
	55.02 Use the production process and relevant modeling and simulation techniques and software to render a complex 3D simulation.
	55.03 Communicate the relevance of the simulation and its impact on the real world.

Florida Department of Education
Student Performance Standards

Course Title: **Modeling and Simulation Innovation and Prototyping**
Course Number: **9005240**
Course Credit: **1**

Course Description:

This course provides students with the extended modeling and simulation content and skills essential for innovating, designing and producing prototypes.

Hands-on activities using an entry-level modeling and simulation development tool (e.g., Auto Desk, Solid Works or other comparable software) should be integrated into the curriculum. **Regardless of topic sequencing, the culminating activity is the completion of a capstone project to demonstrate competency in the field of modeling and simulation research, design and practice and to aide in the completion of a professional portfolio.**

CTE Standards and Benchmarks	
56.0	Explain and utilize project management and logistics to create and develop 3D modeling and simulation products. The student will be able to:
56.01	Explain the process groups and knowledge areas that comprise the Project Management body of knowledge using appropriate PMBOK terminology.
56.02	Define the roles of a Project Manager and stakeholders.
56.03	Discuss the project life cycle and scope.
56.04	Create a work breakdown structure (WBS) making estimates of the required work durations and resource allocations using a performance measurement baseline (PMB) for a project.
56.05	Brainstorm potential risks and develop a risk management plan for the project.
57.0	Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets. The student will be able to:
57.01	Practice ethical behaviors regarding copyright, citation, and plagiarism.
57.02	Understand the process of patent application filing, product trials, and communication techniques to describe their product.
57.03	Explain the purposes of copyrights, trademarks, and patents and understand the limitations and expectations (e.g., open source).
57.04	Explore and examine components of intellectual property such as patents, copyrights, trademarks, and trade secrets.
57.05	Understand “Fair Use and Fair Dealing” practices.
57.06	Understand the transfer and licensing of creative works.
57.07	Understand the use of “exclusive rights” to intellectual creations.

CTE Standards and Benchmarks	
	57.08 Utilize digital watermarking.
58.0	Apply the principles of entrepreneurism to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production. The student will be able to:
	58.01 Identify the usefulness of technology applications.
	58.02 Determine the design architecture.
	58.03 Formulate and test a proof of concept.
	58.04 Understand the value of partnerships and sub-contracting of production and distribution of product.
	58.05 Develop an understanding of the production process.
	58.06 Understand return on investment (ROI) concepts.
	58.07 Examine market analysis of product.
	58.08 Develop a comprehensive business model and present a clear and professional proposal to investors.
59.0	Use innovative technologies to create prototypes of models. The student will be able to:
	59.01 Identify emerging technologies to develop prototypes.
	59.02 Compare and contrast the benefits and limitations of using various prototyping methods and costs.
	59.03 Use emerging technologies to create a prototype (e.g., 3D printing software, 3D printers or other applicable devices).
60.0	Create and design a vector or bitmap art reference to develop a texture map to build a 3D model for simulation. The student will be able to:
	60.01 Know the difference between vectors and bitmaps.
	60.02 Demonstrate an understanding of various 2D art programs.
	60.03 Utilize the programs tools and brushes.
	60.04 Know the importance of layers.
	60.05 Identify file formats.
	60.06 Use digital media software to create a vector of bitmap reference object.
	60.07 Import a reference object into 3D modeling software.
	60.08 Convert a reference object to 3D.
	60.09 Create simple texture in/with a bitmap program.
61.0	Demonstrate the use of experimental and engineering design techniques to produce real world or industry simulations. The students will be able to:
	61.01 Understand the design requirements and limitations of a 2D modeling and simulation engine.

CTE Standards and Benchmarks	
	61.02 Demonstrate the use of various mediums and mixed media (traditional or digital) in a 2D modeling and simulation.
	61.03 Demonstrate the ability to create character and object views for animation.
	61.04 Break down animation into a series of pictures to import animation to a modeling and simulation engine.
	61.05 Demonstrate the effective use of animation loops and cycles in a modeling and simulation engine.
	61.06 Demonstrate an understanding of the value of timing to convey character motion.
	61.07 Demonstrate the effective use of animation arcs for the articulation of body elements.
	61.08 Demonstrate the use of principles of animation such as anticipation, squash, stretch, weight, exaggeration and overlapping and secondary motion.
	61.09 Demonstrate the use of phonemes to display speech in animation.
62.0	Demonstrate an understanding of underlying principles of discreet event simulation and how it relates to modeling and simulation. The student will be able to:
	62.01 Identify discrete event simulations.
	62.02 Use simulation as an analysis tool.
	62.03 Describe the output distribution.
	62.04 Use historical/empirical data.
	62.05 Interpret summary statistics.
	62.06 Interpret confidence and prediction (certainty) intervals.
	62.07 Identify sources and impact of error in simulations.
	62.08 Describe relationships among variables.
	62.09 Describe the effect of correlation on simulation results.
63.0	Implement multimedia programming as it relates to modeling simulation using a physics engine. The student will be able to:
	63.01 Demonstrate proficiency in creating multiple composite objects.
	63.02 Demonstrate proficiency in moving composite graphics objects.
	63.03 Demonstrate proficiency in rotating composite graphics objects manually.
	63.04 Distinguish between flock and flee artificial intelligence algorithms.
	63.05 Write programs that use blitting.
	63.06 Identify the basic constructs used in bounding box collision algorithms.
	63.07 Identify the basic constructs used in truer bounding box collisions.

CTE Standards and Benchmarks	
	63.08 Demonstrate proficiency in creating a bouncing simulation.
	63.09 Simulate pattern-based movement.
	63.10 Simulate multiple sprites movement.
	63.11 Identify the basic constructs used in keyboard input.
	63.12 Identify the basic constructs used in mouse input.
	63.13 Identify the basic constructs used in double buffering.
64.0	Use innovative technologies to create prototypes of models. The student will be able to:
	64.01 Identify emerging technologies to develop prototypes.
	64.02 Compare and contrast the benefits and drawbacks of using various prototyping methods and costs.
	64.03 Use emerging technologies to create a prototype (e.g., 3D printing software, 3D printers or other applicable devices).
	64.04 Communicate the relevance of the simulation and its impact on the real world.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Java Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9007200
CIP Number	0511020500
Grade Level	9-12
Program Length	8 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA-BPL, BPA, SkillsUSA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating regular and specialized applications using the Java programming language, including testing, monitoring, debugging, documenting, and maintaining Java computer applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of eight (8) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
9007210	Foundations of Programming	BUS ED 1 @2 COMP SCI 6 COMP PROG 7G	1 credit	15-1131	3	CT
9007220	Intermediate Programming		1 credit	15-1131	3	CT
9007230	Advanced Programming		1 credit	15-1131	3	CT
9007240	Java Programming Essentials		1 credit	15-1131	3	CT
9007250	Applied Object-Oriented Java Programming		1 credit	15-1131	3	CT
9007260	Java Database Programming		1 credit	15-1131	3	CT
9007270	Java Programming Capstone		1 credit	15-1131	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication
06.0 Use spreadsheet applications to enhance communication skills.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
11.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development.
12.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
13.0 Distinguish between iterative and non-iterative program control structures.
14.0 Describe the processes, methods, and conventions for software development and maintenance.
15.0 Explain the types, uses, and limitations of testing for ensuring quality control.
16.0 Create a program design document using common design tool.
17.0 Solve problems using critical thinking skills, creativity and innovation.
18.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
19.0 Create programs that solve a problem using non-iterative and iterative algorithms.
20.0 Design a computer program to meet specific physical, operational, and interaction criteria.
21.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
22.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.
23.0 Effectively communicate and collaborate.
24.0 Demonstrate responsible use of technology and information.
25.0 Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages.
26.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
27.0 Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements.
28.0 Design, document, and create object-oriented computer programs.
29.0 Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results.
30.0 Understand human-AI interaction.
31.0 Construct statements that declare, initialize, and modify different types of variables used in Java programs.

32.0 Describe the types and characteristics of lexical units in the Java programming language.
33.0 Describe the data types employed in Java programs.
34.0 Construct Java statements that employ the use of various operators.
35.0 Write executable statements using Java.
36.0 Describe variable scope and its implications in Java programming.
37.0 Apply common Java programming style guidelines and conventions.
38.0 Demonstrate use of the compiler and interpreter through command line interface.
39.0 Construct conditional control statements in Java.
40.0 Construct iterative control statements in Java.
41.0 Use nested loop iterative control statements in Java.
42.0 Produce input and output for Java programs.
43.0 Use packages and import statements in a Java program.
44.0 Create a Java program that uses methods.
45.0 Create a Java program that uses parameters in methods.
46.0 Describe and use recursion in a Java program.
47.0 Construct Java statements that use the String class to manipulate String data.
48.0 Construct Java statements that use Classes.
49.0 Manage class relationships.
50.0 Construct Java statements that illustrate the use of multiplicities in class relationships.
51.0 Use object references –
52.0 Describe the types of arrays and construct Java statements that illustrate the use and manipulation of multi-dimensional and jagged arrays.
53.0 Construct Java statements that illustrate different ways of using inheritance.
54.0 Construct Java statements that use collections.
55.0 Write Java code that uses the Iterator and List interfaces.
56.0 Create Java code that includes exception handling code.
57.0 Create Java code that uses the Object class.
58.0 Use standard library classes that comprise the Java API.
59.0 Create Java code that uses exceptions to improve program quality.
60.0 Describe Java 2 Micro Edition (J2ME) uses, characteristics, and constraints.
61.0 Create and convert classes using Unified Modeling Language (UML).
62.0 Create programs that use of Remote Method Invocation (RMI) and other server technologies associated with Relational Database Management Systems (RDMS) and Structured Query Language (SQL).
63.0 Demonstrate an understanding of Java Integration APIs, including Java Message Service (JMS), Enterprise JavaBeans (EJB), and Java Naming and Directory Interface (JNDI).
64.0 Demonstrate an understanding of Java Client APIs, including the Abstract Window Toolkit (AWT), Swing, and Java applet.
65.0 Understand and apply Java 2 Enterprise Edition (J2EE) Server Solutions.
66.0 Create a database application using the Java programming language.
67.0 Create a graphical user interface application using the Java programming language.
68.0 Create a web-based application using the Java programming language.
69.0 Write code to perform common and union database queries using SQL and Java.

70.0 Implement Java program statements using objects.
71.0 Utilize debugging tools and write error handlers.
72.0 Demonstrate file input/output (I/O).
73.0 Utilize API functions.
74.0 Test and debug databases.
75.0 Successfully work as a member of a software development team.
76.0 Manage time according to a plan.
77.0 Keep acceptable records of progress problems and solutions.
78.0 Plan, organize, and carry out a project plan.
79.0 Manage resources.
80.0 Use tools, materials, and processes in an appropriate and safe manner.
81.0 Demonstrate an understanding of the software development process.
82.0 Research content related to the project and document the results following industry conventions.
83.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
84.0 Demonstrate competency in the area of expertise related to developing computer software using the Java programming language.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Programming**
Course Number: **9007210**
Course Credit: **1**

Course Description:

This course introduces concepts, techniques, and processes associated with computer programming and software development.

CTE Standards and Benchmarks	
10.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
10.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
10.02	Locate, organize, and reference written information from various sources.
10.03	Construct writings and/or communications using developmentally appropriate terminology.
10.04	Analyze the positive and negative impacts of technology on popular culture and personal life.
10.05	Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
10.06	Evaluate ways in which adaptive technologies may assist users with special needs.
10.07	Explain how societal and economic factors are affected by access to critical information.
10.08	Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
11.0	Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to:
11.01	Explore a variety of careers to which computing is central.
11.02	Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, and cloud computing).
11.03	Evaluate the impacts of irresponsible use of information (e.g., plagiarism and falsification of data) on collaborative projects.
11.04	Identify tasks performed by programmers.
11.05	Describe how businesses use computer programming to solve business problems.
11.06	Investigate job opportunities in the programming field.
11.07	Explain different specializations and the related training in the computer programming field.
11.08	Explain the need for continuing education and training of computer programmers.

CTE Standards and Benchmarks	
	11.09 Understand and identify ways to use technology to support lifelong learning.
	11.10 Explain software as a service (SaaS) and how it impacts business.
	11.11 Describe ethical responsibilities of computer programmers.
	11.12 Identify credentials and certifications that may improve employability for a computer programmer.
	11.13 Identify devices, tools, and other environments for which programmers may develop software.
12.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to:
	12.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	12.02 Explain the types and uses of variables in programs.
	12.03 Determine the best data type to use for given programming problems.
	12.04 Compare and contrast simple data structures and their uses.
	12.05 Identify the types of operations that can be performed on different data types (e.g., math operations on numerical data types, concatenation, and other string operations).
	12.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	12.07 Explain how computers store different data types in memory.
	12.08 Demonstrate the difference between "data" and "information".
	12.09 Use different number systems to represent data.
	12.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	12.11 Use Boolean logic to perform logical operations using Boolean algebra and truth tables.
13.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	13.01 Identify the uses of non-iterative and iterative programming structures.
	13.02 Create iterative programming structures and their uses (e.g., loops).
	13.03 Create non-iterative programming structures (e.g., conditionals, procedures).
	13.04 Explain how sequence, selection, and iteration are building blocks of algorithms.
	13.05 Use pseudocode and flowcharts to write algorithms.
14.0	Describe the processes, methods, and conventions for software development and maintenance. The student will be able to:
	14.01 Describe a software development process that is used to solve problems at different software development stages.
	14.02 Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).

CTE Standards and Benchmarks	
	14.03 List and explain the steps in the program development cycle.
	14.04 Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	14.05 Describe different methods used to facilitate version control.
15.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
	15.01 Explain the uses and limits of testing in ensuring program quality.
	15.02 Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	15.03 Describe and identify types of programming errors.
16.0	Create a program design document using common design tool. The student will be able to:
	16.01 Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	16.02 Describe and use tools for developing a program design (e.g., flowcharts, design documents, pseudocode).
	16.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	16.04 Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode).
	16.05 Develop a software artifact (independently and collaboratively) in phases (or stages) according to a common software development methodology (e.g., Waterfall or Spiral model).
	16.06 Define input and output for a program module using standard design methodology.
17.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	17.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	17.02 Employ critical thinking and collaborative skills to resolve conflicts.
	17.03 Identify and document workplace performance goals and monitor progress toward those goals.
	17.04 Conduct technical research to gather information necessary for decision-making.
	17.05 Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
18.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:
	18.01 Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	18.02 Discuss the impact of government regulation on privacy and security.
	18.03 Describe how different types of software licenses (e.g., open source and proprietary licenses) can be used to share and protect

CTE Standards and Benchmarks		
		intellectual property.
	18.04	Explain how access to information may not include the right to distribute the information.
	18.05	Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software.
	18.06	Discuss security and privacy issues that relate to computer networks.
	18.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
19.0	Create programs that solve a problem using non-iterative and iterative algorithms. The student will be able to:	
	19.01	Apply the developmental cycle methodologies to create a program.
	19.02	Develop a program using string and/or numeric data types.
	19.03	Develop a program using sequential algorithms.
	19.04	Develop a program using selection structures.
	19.05	Develop a program using looping structures.

Florida Department of Education
Student Performance Standards

Course Title: **Intermediate Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
20.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:
20.01	Choose appropriate data types depending on the needs of the program.
20.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
20.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
20.04	Compare techniques for analyzing massive data collections.
20.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
20.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
20.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
20.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
21.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
21.01	Use appropriate naming conventions to define program variables and methods.
21.02	Use a program editor to write the source code for a program.
21.03	Write programs that use selection structures.
21.04	Write programs that use repetition structures.
21.05	Write programs that use nested structures.
21.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.

CTE Standards and Benchmarks	
	21.07 Compile, run, test and debug programs.
	21.08 Write programs that use standard arithmetic operators with different numerical data types.
	21.09 Write programs that use standard logic operators.
	21.10 Write programs that use a variety of common data types.
	21.11 Write programs that perform data conversion between numeric and string data types.
	21.12 Write programs that define, use, search, and sort arrays.
	21.13 Write programs that use user-defined data types.
	21.14 Demonstrate understanding and use of appropriate variable scope.
	21.15 Use global and local scope appropriately in program implementation.
	21.16 Distinguish between binary and sequential searches.
22.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	22.01 Determine the results of code segments.
	22.02 Write programs that perform user input and output.
	22.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	22.04 Write program modules such as functions, subroutines, or methods.
	22.05 Write program modules that accept arguments.
	22.06 Write program modules that return values.
	22.07 Write program modules that validate arguments and return error codes.
	22.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	22.09 Use APIs and libraries to facilitate programming solutions.
	22.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
	22.11 Explain how abstraction manages complexity.
23.0	Effectively communicate and collaborate. The student will be able to:
	23.01 Evaluate modes of communication and collaboration.
	23.02 Select appropriate tools within a project environment to communicate with project team members.
	23.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a

CTE Standards and Benchmarks	
	collaborative software project.
23.04	Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
23.05	Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
23.06	Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
24.0	Demonstrate responsible use of technology and information. The student will be able to:
24.01	Implement an encryption, digital signature, or authentication method.
24.02	Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
24.03	Identify and explain the existence of biases in computer programming.
24.04	Explain how computing can play a role in social and political issues.
25.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
25.01	Differentiate between multiple levels of operating system, translation, and interpretation that support program execution.
25.02	Explain the program execution process (by an interpreter and in CPU hardware).
25.03	Describe object-oriented concepts.
25.04	Explain the characteristics of procedural and object-oriented programming languages.
25.05	Compare and contrast programming languages that are compiled, interpreted, and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Programming**
Course Number: **9007230**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing object-oriented programming techniques.

CTE Standards and Benchmarks	
26.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
26.01	Demonstrate the understanding and use of classes, objects, attributes, and behaviors.
26.02	Demonstrate the understanding and use of inheritance.
26.03	Demonstrate the understanding and use of data encapsulation.
26.04	Demonstrate the understanding and use of polymorphism.
26.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
27.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements. The student will be able to:
27.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it.
27.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements, and other common components of a requirements document.
27.03	Design an object-oriented program using standard design methodology.
27.04	Work with other team members to develop a project plan for a program.
27.05	Work with other team members to write a design document for a program with multiple functions and shared data.
27.06	Participate in design meetings that review program design documents for conformance to program requirements.
27.07	Estimate the time to develop a program or module.
27.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
28.0	Design, document, and create object-oriented computer programs. The student will be able to:
28.01	Compare and contrast recursive functions to other iterative methods.

CTE Standards and Benchmarks	
	28.02 Understand the implementation of character strings in the programming language.
	28.03 Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
	28.04 Write programs that implements user-defined data types.
	28.05 Decompose a problem by defining new functions and classes.
	28.06 Write object-oriented programs that implement inheritance.
	28.07 Write object-oriented programs that implement polymorphism.
	28.08 Develop class constructors.
	28.09 Write programs that define and use program constants.
	28.10 Write programs that perform error handling.
	28.11 Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity, and conformance to program design documents.
	28.12 Describe the concept of parallel processing as a strategy to solve large problems.
	28.13 Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	28.14 Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	28.15 Write programs that are event-driven.
	28.16 Write programs that perform file input and output (i.e., sequential and random-access file input/output).
	28.17 Explain the value of heuristic algorithms to approximate solutions for unmanageable problems (e.g., a heuristic solution to Towers of Hanoi).
29.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:
	29.01 Develop a test plan for an object-oriented program.
	29.02 Write test plans for programs that perform file input and output.
	29.03 Perform test and debug activities on object-oriented programs, including those written by someone else.
	29.04 Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	29.05 Document the findings of testing in a test report.
30.0	Understand human-AI interaction. The student will be able to:
	30.01 Describe the unique features of computers embedded in mobile devices and vehicles.
	30.02 Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.

CTE Standards and Benchmarks	
30.03	Describe the process of designing software to support specialized forms of human-computer interaction.
30.04	Explain the notion of intelligent behavior through computer modeling and robotics.
30.05	Describe common measurements of machine intelligence (e.g., Turing test).
30.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception, machine learning).
30.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space, and automotive fields.

Florida Department of Education
Student Performance Standards

Course Title: **Java Programming Essentials**
Course Number: **9007240**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to the Java programming language.

CTE Standards and Benchmarks	
31.0	Construct statements that declare, initialize, and modify different types of variables used in Java programs. The student will be able to:
31.01	Explain how variables are utilized in programs.
31.02	Identify the eight Java primitive data types and incorporate their usages in building Java programs.
31.03	Identify the minimum and maximum ranges of primitive data types.
31.04	Identify which data type should be used for a given situation.
31.05	Identify the syntax for using variables and how they represent data.
31.06	Declare and initialize variables so that the end-user can easily identify.
31.07	Discover how to assign new values to variables.
31.08	Create and use constant variables.
32.0	Describe the types and characteristics of lexical units in the Java programming language. The student will be able to:
32.01	Describe the types of lexical units and how they perform within the program.
32.02	Describe identifiers and identify valid and invalid identifiers.
32.03	Describe and identify reserved words, delimiters, literals, and comments showing where their effect is on the program.
33.0	Describe the data types employed in Java programs. The student will be able to:
33.01	Describe the data type categories and how they interact with Java.
33.02	Identify and provide examples of primitive and reference data types in Java and explain their appropriate use in writing efficient and effective Java programs.
33.03	Identify and use enumerations.
33.04	Understand the use of Wrapper Classes in programs.

CTE Standards and Benchmarks	
	33.05 Describe the difference between real and integer data types.
34.0	Construct Java statements that employ the use of various operators. The student will be able to:
	34.01 Construct statements using arithmetic operators to make decisions within the program.
	34.02 Construct statements using relational operators.
	34.03 Construct and use statements using logical operators such as && - || - !.
	34.04 Construct and use statements using assignment operators (+=, -=, *=, /=, %=).
	34.05 Construct and execute statements using operator precedence.
35.0	Write executable statements using Java. The student will be able to:
	35.01 Perform variable assignment statements.
	35.02 Construct statements using built-in Math functions such as Math.max(x, y) and Math.min(x, y).
	35.03 Differentiate between implicit and explicit data type conversions.
	35.04 Describe when implicit data type conversions take place.
	35.05 List the drawbacks of implicit data type conversions and discuss how to navigate around this limitation.
	35.06 Describe the process of autoboxing and promotion.
	35.07 Construct statements using functions to explicitly convert data types.
36.0	Describe variable scope and its implications in Java programming. The student will be able to:
	36.01 Understand the scope and visibility of variables (Instance, Static, and Local).
	36.02 Write programs using local variables.
	36.03 Describe the scope of a variable and how this will be solved.
	36.04 Describe the default value of local, instance, and static scope of variables.
	36.05 Describe how compiler uses scope to identify variables with the same name.
37.0	Apply common Java programming style guidelines and conventions. The student will be able to:
	37.01 Identify and apply examples of good programming practices to produce quality program builds, ensuring adherence to acceptable industry protocols.
	37.02 Insert comments into code that promote clear instructions to the end-user.
	37.03 Follow formatting guidelines when writing code.
	37.04 Understand the different types of errors produced by programs.

CTE Standards and Benchmarks	
38.0	Demonstrate use of the compiler and interpreter through command line interface. The student will be able to:
38.01	Describe the use of the Java compiler (javac) and Java interpreter (Java VM).
38.02	Demonstrate the use of the - classpath flag and –d flag to the compiler.
38.03	Identify the environmental variables of PATH and CLASSPATH.
38.04	Explain the process of command line arguments in a program and differentiate between the various types of arguments.
38.05	Create programs that take in multiple command line arguments.
39.0	Construct conditional control statements in Java. The student will be able to:
39.01	Construct and use an if statement to automatically accept or reject the initial condition.
39.02	Construct and use a switch statement.
39.03	Construct and use while, do-while, and for loops, and demonstrate how to combine them effectively to produce the desired output.
39.04	Construct and use a conditional operator.
40.0	Construct iterative control statements in Java. The student will be able to:
40.01	Describe the types of loop statements and their uses.
40.02	Construct and use the while and do while look and develop fundamental understanding of when to use each loop.
40.03	Construct and use the for loop and setting controls for the appropriate amount of iterations.
40.04	Construct and use the enhanced for loop (also known as the for-each loop).
40.05	Describe when a while loop is used and provide evidence of both successful and non-successful execution.
40.06	Describe when a for loop is used.
41.0	Use nested loop iterative control statements in Java. The student will be able to:
41.01	Construct and execute a program using nested loops.
41.02	Construct and execute a loop using break and continue while showing the break being used in the appropriate manner.
41.03	Evaluate a nested loop construct and sentinel value.
42.0	Produce input and output for Java programs. The student will be able to:
42.01	Describe and use classes (e.g., Scanner, System) to input data into programs.
42.02	Demonstrate the use of different ways to input data into programs using Scanner or System class.
42.03	Describe and demonstrate the use of the System class to produce console output and diagnose any issues that may arise during this process.

CTE Standards and Benchmarks	
	42.04 Explain the difference between print and println functions in the System class.
	42.05 Create and use escape sequences such as /n and /t.
43.0	Use packages and import statements in a Java program. The student will be able to:
	43.01 Describe the use of import statements.
	43.02 Explain the purpose of packages and describe when and how to use them.
	43.03 Modify code that uses package statements to avoid class conflict.
	43.04 Create packages that abide by standard Java naming convention to provide code that is clean, readable, and maintainable.
	43.05 Demonstrate the use of Java-API to search for classes and packages.
44.0	Create a Java program that uses methods. The student will be able to:
	44.01 Differentiate between anonymous blocks and methods.
	44.02 Identify the benefits and shortfalls of using methods.
	44.03 Describe a method signature.
	44.04 Create method(s) that are able to function within the program.
	44.05 Describe how a method is invoked.
	44.06 Describe the purpose of overloading methods.
	44.07 Create overloaded methods in programs.
45.0	Create a Java program that uses parameters in methods. The student will be able to:
	45.01 Describe how parameters are passed into functions.
	45.02 Define a parameter and visually recognize the starting and stopping points.
	45.03 Create a method using a parameter.
	45.04 Invoke a method that has parameters.
	45.05 Distinguish between formal and actual parameters.
	45.06 Demonstrate the use of reference parameters in methods.
46.0	Describe and use recursion in a Java program. The student will be able to:
	46.01 Describe the use of recursion in solving problems.
	46.02 Describe the difference of iterative and recursive methods (ex. Towers of Hanoi, Russian Nesting Dolls).

CTE Standards and Benchmarks	
	46.03 Demonstrate the use of direct recursion.
	46.04 Demonstrate the use of indirect recursion.
47.0	Construct Java statements that use the String class to manipulate String data. The student will be able to:
	47.01 Explain the use of the String class and how they are used to build lists, input and output user data.
	47.02 Create code to concatenate strings using the concatenation operator.
	47.03 Demonstrate how to search a string using indexOf method of the String class.
	47.04 Explain the effect of immutability of Strings determining the advantages/ disadvantages of such.
	47.05 Create Strings using string literals, and through new keyword.
	47.06 Demonstrate the use of the following string manipulation methods of the String class: charAt,length ,trim, substring, replace,startsWidth and endsWith.

Florida Department of Education
Student Performance Standards

Course Title: **Applied Object-Oriented Java Programming**
Course Number: **9007250**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to the Java programming language.

CTE Standards and Benchmarks	
48.0	Construct Java statements that use Classes. The student will be able to:
48.01	Describe and identify abstract data types.
48.02	Describe the difference between an object and a class.
48.03	Identify class attributes.
48.04	Create instance variables for a class.
48.05	Use visibility modifiers for attributes.
48.06	Identify constructors and describe their use.
48.07	Describe encapsulation.
48.08	Write class using encapsulation.
48.09	Apply data abstraction through the use of accessor or and mutator methods.
48.10	Describe the equals method.
48.11	Demonstrate the use of classes in methods as both parameters and return types.
48.12	Describe the garbage collection process.
48.13	Demonstrate reusability and extensibility in class creation.
48.14	Demonstrate the use of Comparable interface to compare objects.
49.0	Manage class relationships. The student will be able to:
49.01	Explain the association relationship among classes.
49.02	Explain the direct association relationship among classes.
49.03	Explain the composition and aggregation relationship among classes.

CTE Standards and Benchmarks	
	49.04 Write programs that use composition, association.
	49.05 Write programs that use direct association.
50.0	Construct Java statements that illustrate the use of multiplicities in class relationships. The student will be able to:
	50.01 Describe how multiplicities affect class relationships.
	50.02 Describe one-to one, one-to-many, and many-to-many relationships.
	50.03 Write programs that use multiplicities in class relationships.
51.0	Use object references. The student will be able to:
	51.01 Identify reference aliases.
	51.02 Understand and use null reference.
	51.03 Explain the this reference and its use in class creation.
52.0	Describe the types of arrays and construct Java statements that illustrate the use and manipulation of multi-dimensional and jagged arrays. The student will be able to:
	52.01 Declare and initialize and array.
	52.02 Demonstrate the use of initializer lists.
	52.03 Demonstrate the use of arrays in methods.
	52.04 Demonstrate the updating, populating and destroying arrays.
	52.05 Explain linear and binary searching.
	52.06 Sort arrays using selection sort, insertion sort, and bubble sort.
	52.07 Demonstrate the use of multidimensional arrays.
	52.08 Demonstrate the use of jagged arrays.
	52.09 Demonstrate basic hashing using arrays.
53.0	Construct Java statements that illustrate different ways of using inheritance. The student will be able to:
	53.01 Explain the purpose and use of inheritance in object-oriented programming.
	53.02 Explain the difference between single and multiple inheritance.
	53.03 Create parent and child classes.
	53.04 Create overloaded methods.
	53.05 Describe the has-a and is-a relationship.

CTE Standards and Benchmarks	
	53.06 Create class hierarchies.
	53.07 Explain the process of generalization to specification.
	53.08 Demonstrate the use of abstract classes.
	53.09 Explain polymorphism.
	53.10 Create a program that uses polymorphism.
	53.11 Demonstrate the use of the instance of method.
54.0	Construct Java statements that use collections. The student will be able to:
	54.01 Describe data structure of linked lists.
	54.02 Create a linked list manually.
	54.03 Use the ArrayList class.
	54.04 Create a stack and Queue manually.
	54.05 Use the Stack and Queue standard class.
	54.06 Identify which data structure is best fitted for a situation.
	54.07 Use iterators with collections.
	54.08 Identify how to insert, delete, update, and traverse data structures.
55.0	Write Java code that uses the Iterator and List interfaces. The student will be able to:
	55.01 Describe the purpose of interfaces.
	55.02 Create and use interfaces in programs.
	55.03 Use the Comparable interface.
	55.04 Use the Iterator interface and List Interface in programs.
	55.05 Understand the program to the interface principle.
56.0	Create Java code that includes exception handling code. The student will be able to:
	56.01 Describe the advantages of including exception handling code.
	56.02 Describe the purpose of an EXCEPTION section in a program block.
	56.03 Create code to include an EXCEPTION section.
	56.04 List the guidelines for exception handling.

CTE Standards and Benchmarks	
57.0	Create Java code that uses the Object class. The student will be able to:
57.01	Understand the Object class relationship to other classes.
57.02	Demonstrate the use of toString method.
57.03	Demonstrate the use of clone and finalize methods.
57.04	Write program to use Object class functionality.
58.0	Use standard library classes that comprise the Java API. The student will be able to:
58.01	Describe the classes and methods in the basic input/output package.
58.02	Describe the classes and methods in the utilities package.
58.03	Describe the classes and methods in the networking package.
58.04	Describe the classes and methods in the AWT and swing package.
58.05	Describe the classes and methods in the SQL and SQLX package.
59.0	Create Java code that uses exceptions to improve program quality. The student will be able to:
59.01	Explain how exception handling works in Java.
59.02	Trap exceptions using try and catch.
59.03	Explain when to use the finally clause.
59.04	Demonstrate handling exceptions through throwing and catching.
59.05	Create and Exception and manage the exception.
59.06	Explain the use of inheritance and exceptions.

Florida Department of Education
Student Performance Standards

Course Title: **Java Database Programming**
Course Number: **9007260**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to the Java programming language.

CTE Standards and Benchmarks	
60.0	Describe Java 2 Micro Edition (J2ME) uses, characteristics, and constraints. The student will be able to:
60.01	Understand MIDlets.
60.02	Explain CLDC and profiles.
60.03	Explain the constraints specific to J2ME programming when compared to J2SE.
60.04	Understand the high architectural goal of J2ME.
60.05	Create user-defined functions.
61.0	Create and convert classes using Unified Modeling Language (UML). The student will be able to:
61.01	Identify UML elements Classes, abstract Classes, Interfaces.
61.02	Identify UML attributes, operators, visibility modifiers and UML associations.
61.03	Given a set of classes be able to convert the classes to a UML diagram.
61.04	Given a UML diagram be able to create classes.
62.0	Create programs that use of Remote Method Invocation (RMI) and other server technologies associated with Relational Database Management Systems (RDMS) and Structured Query Language (SQL). The student will be able to:
62.01	Understand and describe RMI.
62.02	Write a program to use RMI.
62.03	Understand RDMS and SQL technologies.
62.04	Use the Java Database Connectivity API to connect and execute SQL statements to RDMS.
63.0	Demonstrate an understanding of Java Integration APIs, including Java Message Service (JMS), Enterprise JavaBeans (EJB), and Java Naming and Directory Interface (JNDI). The student will be able to:
63.01	Understand and describe JMS.

CTE Standards and Benchmarks	
	63.02 Understand and describe EJB technology.
	63.03 Understand and describe JNDI technology.
64.0	Demonstrate an understanding of Java Client APIs, including the Abstract Window Toolkit (AWT), Swing, and Java applet. The student will be able to:
	64.01 Understand and describe AWT and GUI interface.
	64.02 Understand and describe the use of Swing components and GUI.
	64.03 Understand and describe the use of applet technology.
65.0	Understand and apply Java 2 Enterprise Edition (J2EE) Server Solutions. The student will be able to:
	65.01 Understand java web Services.
	65.02 Underrated and use SMTP and Java Mail technologies.
	65.03 Understand how to use JSP and Servlets.
66.0	Create a database application using the Java programming language. The student will be able to:
	66.01 Utilize loop statements.
	66.02 Given a scenario, use arithmetic, comparison, and pattern-matching operators.
	66.03 Create user-defined functions.
	66.04 Utilize common built-in functions.
	66.05 Declare variables in modules and procedures.
	66.06 Declare arrays, and initialize elements of arrays.
	66.07 Declare and use object variables and collections, and use their associated properties and methods.
	66.08 Declare symbolic constants, and make them available locally or publicly.
	66.09 Respond to events.
67.0	Create a graphical user interface application using the Java programming language. The student will be able to:
	67.01 Utilize loop statements.
	67.02 Given a scenario, use arithmetic, comparison, and pattern-matching operators.
	67.03 Create user-defined functions.
	67.04 Utilize common built-in functions.
	67.05 Declare variables in modules and procedures.

CTE Standards and Benchmarks	
	67.06 Declare arrays, and initialize elements of arrays.
	67.07 Declare and use object variables and collections, and use their associated properties and methods.
	67.08 Declare symbolic constants, and make them available locally or publicly.
	67.09 Use the Java Event model to handle user inputs from events.
	67.10 Use JComponents and layout managers to create the GUI.
68.0	Create a web-based application using the Java programming language. The student will be able to:
	68.01 Utilize loop statements.
	68.02 Given a scenario, use arithmetic, comparison, and pattern-matching operators.
	68.03 Create user-defined functions.
	68.04 Utilize common built-in functions.
	68.05 Declare variables in modules and procedures.
	68.06 Declare arrays, and initialize elements of arrays.
	68.07 Declare and use object variables and collections, and use their associated properties and methods.
	68.08 Declare symbolic constants, and make them available locally or publicly.
	68.09 Write JSP pages to process user input.
	68.10 Write Servlets to provide input and output processing for the web solution.
69.0	Write code to perform common and union database queries using SQL and Java. The student will be able to:
	69.01 Utilize SQL to write common queries.
	69.02 Refer to objects by using SQL.
	69.03 Utilize union queries.
70.0	Implement Java program statements using objects. The student will be able to:
	70.01 Determine when to use data access objects.
	70.02 Differentiate between objects and collections.
	70.03 Write statements that access and modify database objects, EJB objects.
	70.04 Select appropriate methods and property settings for use with specified objects.
71.0	Utilize debugging tools and write error handlers. The student will be able to:

CTE Standards and Benchmarks	
	71.01 Trap errors.
	71.02 Utilize debugging tools to suspend program execution, and to examine, step through, and reset execution of code.
	71.03 Debug code samples.
	71.04 Utilize the Debugger to monitor variable values.
	71.05 Write an error handler.
72.0	Demonstrate file input/output (I/O). The student will be able to:
	72.01 Read from sequential and random access files.
	72.02 Write to sequential and random access files.
	72.03 Use file serialization.
73.0	Utilize API functions. The student will be able to:
	73.01 Properly declare functions.
	73.02 Use the by value and by reference parameters.
74.0	Test and debug databases. The student will be able to:
	74.01 Implement error handling.
	74.02 Test and debug library databases.

Florida Department of Education
Student Performance Standards

Course Title: **Java Programming Capstone**
Course Number: **9007270**
Course Credit: **1**

Course Description:

This course serves as the capstone course, providing students with the opportunity to apply acquired computer programming knowledge and skills specific to the Java programming language. The range of competencies students will be expected to demonstrate include project planning, design, documentation, Java programming, and reporting/presenting the results of the project. Each student will be expected to maintain a portfolio of the project and give a presentation of the completed work at the end of the course.

CTE Standards and Benchmarks	
75.0	Successfully work as a member of a software development team. The student will be able to:
75.01	Accept responsibility for specific tasks in a given situation.
75.02	Document progress, and provide feedback on work accomplished in a timely manner.
75.03	Complete assigned tasks in a timely and professional manner.
75.04	Reassign responsibilities when the need arises.
75.05	Complete daily tasks as assigned on one's own initiative.
76.0	Manage time according to a plan. The student will be able to:
76.01	Set realistic time frames and schedules.
76.02	Keep a written time sheet of work accomplished on a daily basis.
76.03	Meet goals and objectives set by the team.
76.04	Identify individual priorities.
76.05	Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.
77.0	Keep acceptable records of progress problems and solutions. The student will be able to:
77.01	Develop a record keeping system in the form of a log book to record daily progress.
77.02	Use a project journal to identify problem statement.
77.03	Develop a portfolio of work accomplished to include design drawings, flowcharts, drawings and plans, and prototypes.
78.0	Plan, organize, and carry out a project plan. The student will be able to:

CTE Standards and Benchmarks	
	78.01 Determine the scope of a project.
	78.02 Organize the team according to individual strengths.
	78.03 Assign specific tasks within a team.
	78.04 Determine project priorities.
	78.05 Identify required resources.
	78.06 Plan research, design, development, and evaluation activities as required.
	78.07 Carry out the project plan to successful completion.
79.0	Manage resources. The student will be able to:
	79.01 Identify required resources for each stage of the project plan.
	79.02 Determine the methods needed to acquire needed resources.
	79.03 Demonstrate good judgment in the use of resources.
	79.04 Recycle and reuse resources where appropriate.
	79.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
80.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	80.01 Identify the proper tool for a given job.
	80.02 Use tools and machines in a safe manner.
	80.03 Adhere to laboratory or job site safety rules and procedures.
	80.04 Identify the application of processes appropriate to the task at hand.
	80.05 Identify materials appropriate to their application.
81.0	Demonstrate an understanding of the software development process. The student will be able to:
	81.01 State the goals of the software application clearly.
	81.02 Identify and write a plan to achieve each goal.
	81.03 Develop a list of materials and content required for each goal.
	81.04 Develop a step by step procedure for developing the application.
	81.05 Follow a written procedure.
	81.06 Record data from evaluation activities.

CTE Standards and Benchmarks	
	81.07 Document conclusions and solutions based on evaluation results, observations and data.
	81.08 Document progress using a project log.
	81.09 Write an abstract describing the project plan.
82.0	Research content related to the project and document the results following industry conventions. The student will be able to:
	82.01 Identify the basic research needed to develop the project plan.
	82.02 Identify available resources for completing background research required in the project plan.
	82.03 Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources.
	82.04 Demonstrate the ability to organize information retrieval.
	82.05 Demonstrate the ability to prepare a topic outline.
	82.06 Write a draft of the research report.
	82.07 Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations, and references.
	82.08 Prepare an electronically composed research paper in proper form.
	82.09 Conduct an alpha and beta evaluation of the project's product.
	82.10 Write a report on the evaluations, documenting results, data, observations, and design changes based on the results.
83.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
	83.01 Prepare a multi-media presentation on the completed project.
	83.02 Make an oral presentation, using multi-media materials.
	83.03 Review the presentation, and make changes in the delivery method(s) to improve presentation skills.
84.0	Demonstrate competency in the area of expertise related to developing computer software using the Java programming language. The student will be able to:
	84.01 Demonstrate a mastery of the content of the selected subject area.
	84.02 Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
	84.03 Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Database Application Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9007300
CIP Number	0511020502
Grade Level	9-12
Program Length	8 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, SkillsUSA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating regular and specialized applications using standard and extended Structured Query Language (SQL), including testing, monitoring, debugging, documenting, and maintaining database applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of eight (8) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary /program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
9007210	Foundations of Programming	BUS ED 1 @2 COMP SCI 6 COMP PROG 7 G	1 credit	15-1131	3	CT
9007220	Intermediate Programming		1 credit	15-1131	3	CT
9007230	Advanced Programming		1 credit	15-1131	3	CT
9007310	Database Design & SQL Programming		1 credit	15-1131	3	CT
9007320	SQL Extension Languages		1 credit	15-1131	3	CT
9007330	SQL Extension Languages II		1 credit	15-1131	3	CT
9007340	Custom Database Programming		1 credit	15-1131	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
11.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development.
12.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
13.0 Distinguish between iterative and non-iterative program control structures.
14.0 Describe the processes, methods, and conventions for software development and maintenance.
15.0 Explain the types, uses, and limitations of testing for ensuring quality control.
16.0 Create a program design document using common design tool.
17.0 Solve problems using critical thinking skills, creativity and innovation.
18.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
19.0 Create programs that solve a problem using non-iterative and iterative algorithms.
20.0 Design a computer program to meet specific physical, operational, and interaction criteria.
21.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
22.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.
23.0 Effectively communicate and collaborate.
24.0 Demonstrate responsible use of technology and information.
25.0 Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages.
26.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
27.0 Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements.
28.0 Design, document, and create object-oriented computer programs.
29.0 Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results.
30.0 Understand human-AI interaction.
31.0 Develop an awareness of the changes taking place in the information age and how they fit into an evolving society.

32.0 Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs.
33.0 Develop the process of creating an entity by identifying relationships.
34.0 Formulate and assemble initial entity relationship by expanding on modeling concepts.
35.0 Consider the degree and optionality of relationships of entities.
36.0 Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams.
37.0 Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships.
38.0 Demonstrate proficiency in designing and adding complexity to a logical model.
39.0 Apply complex logical information by fine-tuning entities and the process for relating them.
40.0 Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved.
41.0 Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion or mistakes.
42.0 Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data.
43.0 Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database.
44.0 Extend the logical model presentation model by normalizing the data and mapping the management system.
45.0 Apply techniques for building a storage management system by creating a website using templates and wizards.
46.0 Demonstrate design and functionality by constructing a group business presentation.
47.0 Demonstrate comprehension of database modeling competency through group presentation.
48.0 Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints.
49.0 Demonstrate comprehension of aspects of SQL language interface by writing basic SQL statements.
50.0 Demonstrate proficiency working with columns, characters, and rows in SQL.
51.0 Demonstrate proficiency in using SQL comparison operators.
52.0 Demonstrate proficiency in using logical comparisons and precedence rules.
53.0 Demonstrate proficiency using SQL single row functions.
54.0 Demonstrate proficiency displaying data from multiple tables.
55.0 Demonstrate proficiency aggregating data using group functions.
56.0 Demonstrate proficiency utilizing subqueries.
57.0 Demonstrate proficiency producing readable output with SQL language interface, reporting tool, and data manipulation language.
58.0 Demonstrate proficiency creating and managing database objects.
59.0 Demonstrate proficiency altering tables and constraints implementing views.
60.0 Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects.
61.0 Demonstrate ability to control user access and SQL language interface and reporting tool.
62.0 Demonstrate comprehension of bundling features of SQL.
63.0 Demonstrate comprehension working with composite data types by writing executable script files.
64.0 Describe the differences between SQL and SQL extension languages.
65.0 Create program blocks.
66.0 Use variables in program blocks.
67.0 Recognize lexical units.

68.0 Recognize data types.
69.0 Use scalar data types.
70.0 Use various types of joins.
71.0 Use SQL group functions and subqueries.
72.0 Write executable statements.
73.0 Use nested blocks and variable scope.
74.0 Use good programming practices.
75.0 Write DML statements to manipulate data.
76.0 Retrieve data.
77.0 Manipulate data.
78.0 Use transaction control statements.
79.0 Use IF conditional control statements.
80.0 Use CASE conditional control statements.
81.0 Use basic LOOP iterative control statements.
82.0 Use WHILE and FOR loop iterative control statements.
83.0 Use nested loop iterative control statements.
84.0 Use explicit cursors.
85.0 Use explicit cursor attributes.
86.0 Use cursor FOR loops.
87.0 Use cursors with parameters.
88.0 Use cursors for update transactions.
89.0 Use multiple cursors.
90.0 Handle exceptions.
91.0 Trap server exceptions.
92.0 Trap user-defined exceptions.
93.0 Create procedures.
94.0 Use parameters in procedures.
95.0 Pass parameters.
96.0 Create stored functions.
97.0 Use functions in SQL statements.
98.0 Manage procedures and functions.
99.0 Manage object privileges.
100.0 Use invoker’s rights.
101.0 Create packages.
102.0 Manage package constructs.
103.0 Use advanced package concepts.
104.0 Manage persistent state of package variables.
105.0 Use vendor-supplied packages.
106.0 Understand dynamic SQL.
107.0 Understand triggers.

108.0 Create DML triggers.
109.0 Create DDL and database event triggers.
110.0 Manage triggers.
111.0 Use large object data types.
112.0 Manage binary types.
113.0 Manage indexes.
114.0 Manage dependencies.
115.0 Demonstrate an understanding of Agile Development.
116.0 Program a database application.
117.0 Utilize the basic concepts of database design.
118.0 Utilize SQL and union queries.
119.0 Implement program statements using objects.
120.0 Utilize debugging tools and write error handlers.
121.0 Demonstrate file I/O.
122.0 Create forms and identify all the properties of a form.
123.0 Manipulate data using object models.
124.0 Develop custom controls.
125.0 Utilize API functions.
126.0 Demonstrate and implement database replication using programming tools.
127.0 Analyze and implement security options.
128.0 Implement client/server applications.
129.0 Optimize the performance of a database.
130.0 Perform application distribution.
131.0 Test and debug databases.
132.0 Describe the difference between relational and NoSQL databases.
133.0 Demonstrate an understanding of Data Science and the concept of Data mining.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Programming**
Course Number: **9007210**
Course Credit: **1**

Course Description:

This course introduces concepts, techniques, and processes associated with computer programming and software development.

CTE Standards and Benchmarks	
10.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
10.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
10.02	Locate, organize, and reference written information from various sources.
10.03	Construct writings and/or communications using developmentally appropriate terminology.
10.04	Analyze the positive and negative impacts of technology on popular culture and personal life.
10.05	Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
10.06	Evaluate ways in which adaptive technologies may assist users with special needs.
10.07	Explain how societal and economic factors are affected by access to critical information.
10.08	Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
11.0	Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to:
11.01	Explore a variety of careers to which computing is central.
11.02	Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, and cloud computing).
11.03	Evaluate the impacts of irresponsible use of information (e.g., plagiarism and falsification of data) on collaborative projects.
11.04	Identify tasks performed by programmers.
11.05	Describe how businesses use computer programming to solve business problems.
11.06	Investigate job opportunities in the programming field.
11.07	Explain different specializations and the related training in the computer programming field.
11.08	Explain the need for continuing education and training of computer programmers.

CTE Standards and Benchmarks	
	11.09 Understand and identify ways to use technology to support lifelong learning.
	11.10 Explain software as a service (SaaS) and how it impacts business.
	11.11 Describe ethical responsibilities of computer programmers.
	11.12 Identify credentials and certifications that may improve employability for a computer programmer.
	11.13 Identify devices, tools, and other environments for which programmers may develop software.
12.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to:
	12.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	12.02 Explain the types and uses of variables in programs.
	12.03 Determine the best data type to use for given programming problems.
	12.04 Compare and contrast simple data structures and their uses.
	12.05 Identify the types of operations that can be performed on different data types (e.g., math operations on numerical data types, concatenation, and other string operations).
	12.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	12.07 Explain how computers store different data types in memory.
	12.08 Demonstrate the difference between "data" and "information".
	12.09 Use different number systems to represent data.
	12.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	12.11 Use Boolean logic to perform logical operations using Boolean algebra and truth tables.
13.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	13.01 Identify the uses of non-iterative and iterative programming structures.
	13.02 Create iterative programming structures and their uses (e.g., loops).
	13.03 Create non-iterative programming structures (e.g., conditionals, procedures).
	13.04 Explain how sequence, selection, and iteration are building blocks of algorithms.
	13.05 Use pseudocode and flowcharts to write algorithms.
14.0	Describe the processes, methods, and conventions for software development and maintenance. The student will be able to:
	14.01 Describe a software development process that is used to solve problems at different software development stages.
	14.02 Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).

CTE Standards and Benchmarks	
	14.03 List and explain the steps in the program development cycle.
	14.04 Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	14.05 Describe different methods used to facilitate version control.
15.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
	15.01 Explain the uses and limits of testing in ensuring program quality.
	15.02 Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	15.03 Describe and identify types of programming errors.
16.0	Create a program design document using common design tool. The student will be able to:
	16.01 Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	16.02 Describe and use tools for developing a program design (e.g., flowcharts, design documents, pseudocode).
	16.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	16.04 Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode).
	16.05 Develop a software artifact (independently and collaboratively) in phases (or stages) according to a common software development methodology (e.g., Waterfall or Spiral model).
	16.06 Define input and output for a program module using standard design methodology.
17.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	17.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	17.02 Employ critical thinking and collaborative skills to resolve conflicts.
	17.03 Identify and document workplace performance goals and monitor progress toward those goals.
	17.04 Conduct technical research to gather information necessary for decision-making.
	17.05 Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
18.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:
	18.01 Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	18.02 Discuss the impact of government regulation on privacy and security.
	18.03 Describe how different types of software licenses (e.g., open source and proprietary licenses) can be used to share and protect

CTE Standards and Benchmarks		
		intellectual property.
	18.04	Explain how access to information may not include the right to distribute the information.
	18.05	Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software.
	18.06	Discuss security and privacy issues that relate to computer networks.
	18.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
19.0	Create programs that solve a problem using non-iterative and iterative algorithms. The student will be able to:	
	19.01	Apply the developmental cycle methodologies to create a program.
	19.02	Develop a program using string and/or numeric data types.
	19.03	Develop a program using sequential algorithms.
	19.04	Develop a program using selection structures.
	19.05	Develop a program using looping structures.

Florida Department of Education
Student Performance Standards

Course Title: **Intermediate Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
20.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:
20.01	Choose appropriate data types depending on the needs of the program.
20.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
20.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
20.04	Compare techniques for analyzing massive data collections.
20.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
20.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
20.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
20.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
21.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
21.01	Use appropriate naming conventions to define program variables and methods.
21.02	Use a program editor to write the source code for a program.
21.03	Write programs that use selection structures.
21.04	Write programs that use repetition structures.
21.05	Write programs that use nested structures.
21.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.

CTE Standards and Benchmarks	
	21.07 Compile, run, test and debug programs.
	21.08 Write programs that use standard arithmetic operators with different numerical data types.
	21.09 Write programs that use standard logic operators.
	21.10 Write programs that use a variety of common data types.
	21.11 Write programs that perform data conversion between numeric and string data types.
	21.12 Write programs that define, use, search, and sort arrays.
	21.13 Write programs that use user-defined data types.
	21.14 Demonstrate understanding and use of appropriate variable scope.
	21.15 Use global and local scope appropriately in program implementation.
	21.16 Distinguish between binary and sequential searches.
22.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	22.01 Determine the results of code segments.
	22.02 Write programs that perform user input and output.
	22.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	22.04 Write program modules such as functions, subroutines, or methods.
	22.05 Write program modules that accept arguments.
	22.06 Write program modules that return values.
	22.07 Write program modules that validate arguments and return error codes.
	22.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	22.09 Use APIs and libraries to facilitate programming solutions.
	22.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
	22.11 Explain how abstraction manages complexity.
23.0	Effectively communicate and collaborate. The student will be able to:
	23.01 Evaluate modes of communication and collaboration.
	23.02 Select appropriate tools within a project environment to communicate with project team members.
	23.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a

CTE Standards and Benchmarks	
	collaborative software project.
23.04	Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
23.05	Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
23.06	Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
24.0	Demonstrate responsible use of technology and information. The student will be able to:
24.01	Implement an encryption, digital signature, or authentication method.
24.02	Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
24.03	Identify and explain the existence of biases in computer programming.
24.04	Explain how computing can play a role in social and political issues.
25.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
25.01	Differentiate between multiple levels of operating system, translation, and interpretation that support program execution.
25.02	Explain the program execution process (by an interpreter and in CPU hardware).
25.03	Describe object-oriented concepts.
25.04	Explain the characteristics of procedural and object-oriented programming languages.
25.05	Compare and contrast programming languages that are compiled, interpreted, and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Programming**
Course Number: **9007230**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing object-oriented programming techniques.

CTE Standards and Benchmarks	
26.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
26.01	Demonstrate the understanding and use of classes, objects, attributes, and behaviors.
26.02	Demonstrate the understanding and use of inheritance.
26.03	Demonstrate the understanding and use of data encapsulation.
26.04	Demonstrate the understanding and use of polymorphism.
26.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
27.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements. The student will be able to:
27.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it.
27.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements, and other common components of a requirements document.
27.03	Design an object-oriented program using standard design methodology.
27.04	Work with other team members to develop a project plan for a program.
27.05	Work with other team members to write a design document for a program with multiple functions and shared data.
27.06	Participate in design meetings that review program design documents for conformance to program requirements.
27.07	Estimate the time to develop a program or module.
27.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
28.0	Design, document, and create object-oriented computer programs. The student will be able to:
28.01	Compare and contrast recursive functions to other iterative methods.

CTE Standards and Benchmarks	
	28.02 Understand the implementation of character strings in the programming language.
	28.03 Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
	28.04 Write programs that implements user-defined data types.
	28.05 Decompose a problem by defining new functions and classes.
	28.06 Write object-oriented programs that implement inheritance.
	28.07 Write object-oriented programs that implement polymorphism.
	28.08 Develop class constructors.
	28.09 Write programs that define and use program constants.
	28.10 Write programs that perform error handling.
	28.11 Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity, and conformance to program design documents.
	28.12 Describe the concept of parallel processing as a strategy to solve large problems.
	28.13 Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	28.14 Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	28.15 Write programs that are event-driven.
	28.16 Write programs that perform file input and output (i.e., sequential and random-access file input/output).
	28.17 Explain the value of heuristic algorithms to approximate solutions for unmanageable problems (e.g., a heuristic solution to Towers of Hanoi).
29.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:
	29.01 Develop a test plan for an object-oriented program.
	29.02 Write test plans for programs that perform file input and output.
	29.03 Perform test and debug activities on object-oriented programs, including those written by someone else.
	29.04 Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	29.05 Document the findings of testing in a test report.
30.0	Understand human-AI interaction. The student will be able to:
	30.01 Describe the unique features of computers embedded in mobile devices and vehicles.
	30.02 Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.

CTE Standards and Benchmarks	
30.03	Describe the process of designing software to support specialized forms of human-computer interaction.
30.04	Explain the notion of intelligent behavior through computer modeling and robotics.
30.05	Describe common measurements of machine intelligence (e.g., Turing test).
30.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception, machine learning).
30.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space, and automotive fields.

Florida Department of Education
Student Performance Standards

Course Title: **Database Design and SQL Programming**
Course Number: **9007310**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to the SQL programming language.

CTE Standards and Benchmarks	
31.0	Develop an awareness of the changes taking place in the information age and how they fit into an evolving society. The student will be able to:
31.01	Cite examples of jobs, salary, and opportunities he/she will have as a database programmer.
31.02	Describe the role a database plays in a business.
31.03	Understand the importance of clear communication when discussing business informational requirements.
31.04	Identify important historical contributions in database development and design.
32.0	Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs. The student will be able to:
32.01	Identify and analyze the phases of the database development process.
32.02	Explain what logical data modeling and database design involve.
32.03	Compare database development process with that of the application development process.
32.04	Distinguish between a logical model and a physical implementation.
33.0	Develop the process of creating an entity by identifying relationships. The student will be able to:
33.01	Identify and model various types of entities.
33.02	Identify naming and drawing conventions for entities.
33.03	Sequence the steps that are necessary for creation of an entity.
33.04	Analyze and model the relationships between entities.
34.0	Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to:
34.01	Analyze and model attributes.
34.02	Identify unique identifiers for each entity.

CTE Standards and Benchmarks	
	34.03 Develop an entity relationship diagram tagging attributes with optionality.
35.0	Consider the degree and optionality of relationships of entities. The student will be able to:
	35.01 Create entity relationship models based on information requirements and interviews.
	35.02 Differentiate between one-to-many, many-to-many and one-to-one relationships.
	35.03 Identify relationship between two entities by reading a given diagram.
	35.04 Create a relationship between instances of the same entity.
	35.05 Read an entity relationship model in order to validate it.
36.0	Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to:
	36.01 Identify the significance of an attribute that has more than one value for each entity instance.
	36.02 Evaluate appropriate methods of storing validation rules for attributes.
	36.03 Recognize unique identifiers inherited from other entities.
	36.04 Sequence the steps involved in resolving a many-to-many relationship.
37.0	Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to:
	37.01 Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID).
	37.02 Resolve many-to-many relationships with intersection entities.
	37.03 Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships.
	37.04 Create exclusive entities and relationships by using subtypes and arcs, respectively.
	37.05 Identify initial layout for presentation and generate a list of action items for members of group.
	37.06 Develop an entity relationship model using subtypes, super-types and an exclusive arc.
38.0	Demonstrate proficiency in designing and adding complexity to a logical model. The student will be able to:
	38.01 Revise an entity relationship model according to client requirements.
	38.02 Define and give examples of hierarchical and recursive relationships.
	38.03 Differentiate between transferable and non-transferable relationships.
	38.04 Deliver a professional, formal business style presentation.
	38.05 Evaluate and critique presentation layout, design and performance.
	38.06 Construct a model using both recursion and hierarchies to express the same logical meaning.

CTE Standards and Benchmarks	
39.0	Apply complex logical information by fine-tuning entities and the process for relating them. The student will be able to:
39.01	Describe a relational database and how it differs from other database systems.
39.02	Define primary keys and foreign keys and describe their purpose.
39.03	Describe what data integrity refers to and list some constraints.
39.04	Explain how database design fits into the database development process.
39.05	Translate a logical model into a relational database design.
40.0	Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to:
40.01	Demonstrate ability to implement steps for mapping entity relationship models for implementation.
40.02	Document an initial database design on table instance charts.
40.03	Recognize raw data and evaluate the steps for creating a data group in unnormalized form.
41.0	Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion or mistakes. The student will be able to:
41.01	Differentiate between normalized and unnormalized data.
41.02	Move data from an unnormalized form through to a third normal form.
41.03	Demonstrate ability to test data groups for third normal form compliance.
41.04	Identify optimized data groups from given groups of normalized data.
42.0	Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data. The student will be able to:
42.01	Compare the normalization and logical techniques in terms of strengths and weaknesses.
42.02	Further define normalization and explain its benefits.
42.03	Place tables in third normal form.
42.04	Explain how logical data modeling rules ensure normalized tables.
42.05	Specify referential integrity constraints and design indices.
43.0	Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database. The student will be able to:
43.01	Evaluate the transformation of business requirements into an initial layout and design for a database.
43.02	Construct simple webpage design for personal work folder.
43.03	Evaluate existing websites and determine quality of design.

CTE Standards and Benchmarks	
44.0	Extend the logical model presentation model by normalizing the data and mapping the management system. The student will be able to:
44.01	Formulate a plan of action for the Database Project using skills previously learned in this course.
44.02	Normalize a logical model to the third normal form (3NF).
44.03	Create a table in the database using a database authoring tool.
44.04	Demonstrate ability to edit tables using a database authoring tool.
44.05	Create forms that will display the table components created with a database authoring tool.
45.0	Apply techniques for building a storage management system by creating a website using templates and wizards. The student will be able to:
45.01	Create a website that displays the database project home.
45.02	Link a website to create a web-enabled interface to the industry database.
45.03	Edit the forms created and specify appropriate field labels for data entry.
46.0	Demonstrate design and functionality by constructing a group business presentation. The student will be able to:
46.01	Evaluate and generate criteria for a formal, business presentation.
46.02	Construct a persuasive group presentation using the guidelines set forth in class.
47.0	Demonstrate comprehension of database modeling competency through group presentation. The student will be able to:
47.01	Deliver a formal business presentation for the class that discusses a logical model and initial database design.
47.02	Demonstrate the functionality of the database and the layout/design capabilities of a database authoring tool.
47.03	Prepare appropriate end-user documentation.
47.04	Self-assess learning experience through the presentation and demonstration of their final database project.
48.0	Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints. The student will be able to:
48.01	Identify the structural elements of a relational database table.
48.02	List and describe the system development life cycle.
48.03	Describe the industry implementation of the relational database management system (RDBMS) and object relational database management system (ORDBMS).
48.04	Explain how SQL and languages that extend SQL are used in the industry product set.
48.05	Identify the advantages of a database management system.
49.0	Demonstrate comprehension of aspects of SQL language interface by writing basic SQL statements. The student will be able to:
49.01	List the capabilities of SQL SELECT statements.

CTE Standards and Benchmarks	
	49.02 Execute a basic SELECT statement.
	49.03 Differentiate between SQL statements and language commands that extend SQL.
50.0	Demonstrate proficiency working with columns, characters, and rows in SQL. The student will be able to:
	50.01 Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
	50.02 Use column aliases to rename columns in the query result.
	50.03 Eliminate duplicate rows in the query result.
	50.04 Display the structure of a table.
	50.05 Apply SQL syntax to restrict the rows returned from a query.
	50.06 Demonstrate application of the WHERE clause syntax.
	50.07 Construct and produce output using a SQL query containing character strings and date values.
51.0	Demonstrate proficiency in using SQL comparison operators. The student will be able to:
	51.01 Apply the proper comparison operator to return a desired result.
	51.02 Demonstrate proper use of BETWEEN, IN, and LIKE conditions to return a desired result.
	51.03 Distinguish between zero and the value of NULL as unavailable, unassigned, unknown, or inapplicable.
	51.04 Explain the use of comparison conditions and NULL.
52.0	Demonstrate proficiency in using logical comparisons and precedence rules. The student will be able to:
	52.01 Evaluate logical comparisons to restrict the rows returned based on two or more conditions.
	52.02 Apply the rules of precedence to determine the order in which expressions are evaluated and calculated.
	52.03 Construct a query to order a results set for single or multiple columns.
	52.04 Construct a query to sort a results set in ascending or descending order.
53.0	Demonstrate proficiency using SQL single row functions. The student will be able to:
	53.01 Perform calculations on data.
	53.02 Modify individual data items.
	53.03 Use character, number and date functions in SELECT statements.
	53.04 Format data and numbers for display purposes.
	53.05 Convert column data types.

CTE Standards and Benchmarks	
54.0	Demonstrate proficiency displaying data from multiple tables. The student will be able to:
54.01	Construct SELECT statements to access data from more than one table using equity and non-equality joins.
54.02	Use outer joins through viewing data that generally does not meet a join condition.
54.03	Join a table to itself.
55.0	Demonstrate proficiency aggregating data using group functions. The student will be able to:
55.01	Identify the available group functions and describe their use.
55.02	Demonstrate the ability to group data through the use of the GROUP BY clause.
55.03	Demonstrate the ability to include or exclude grouped rows by using the HAVING clause.
56.0	Demonstrate proficiency utilizing subqueries. The student will be able to:
56.01	Write a query with an embedded subquery.
56.02	Evaluate and perform a multiple-column subquery.
56.03	Describe and explain the behavior of subqueries when NULL values are retrieved.
56.04	Create a subquery in a FROM clause.
57.0	Demonstrate proficiency producing readable output with SQL language interface, reporting tool, and data manipulation language. The student will be able to:
57.01	Produce queries that require an input variable.
57.02	Customize the SQL language interface and reporting environment using SET commands for control.
57.03	Produce more readable output through the use of the column and break commands.
57.04	Describe data manipulation language (DML) and describe various DML statements.
57.05	Utilize data manipulation language (DML) through inserting, updating and deleting rows from a table.
57.06	Control transactions using COMMIT and ROLLBACK statements.
58.0	Demonstrate proficiency creating and managing database objects. The student will be able to:
58.01	Describe the main database objects.
58.02	Create tables and alter their definitions.
58.03	Describe the data types that can be used when specifying column definition.
59.0	Demonstrate proficiency altering tables and constraints implementing views. The student will be able to:
59.01	Create, drop, rename and truncate tables using SQL.

CTE Standards and Benchmarks	
	59.02 Identify and describe various constraints including not NULL, unique, primary key, foreign key, and check.
	59.03 Create and maintain constraints including adding, dropping, enabling, disabling, and cascading.
	59.04 Recognize views and explain how they are created, how they retrieve data and how they perform DML operations.
60.0	Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects. The student will be able to:
	60.01 Create views, retrieve data through a view, alter the definition of a view and drop a view.
	60.02 Categorize information by using Top-N queries to retrieve specified data.
	60.03 Identify the features of a sequence and display sequence values using a data dictionary view.
	60.04 Identify the characteristics of a cached sequence.
	60.05 Modify and remove a sequence using a SQL statement.
	60.06 Identify the features of private and public synonyms.
	60.07 Identify characteristics of an index and describe different types.
	60.08 Create and remove an index using a SQL statement.
61.0	Demonstrate ability to control user access and SQL language interface and reporting tool. The student will be able to:
	61.01 Identify the features of database security.
	61.02 Create users using SQL statements.
	61.03 Grant and revoke object privileges using a SQL language interface and reporting tool.
62.0	Demonstrate comprehension of bundling features of SQL. The student will be able to:
	62.01 List and describe the benefits of extension languages to SQL.
	62.02 Recognize the basic SQL block and its sections.
	62.03 Declare SQL variables and describe their significance.
	62.04 Execute a SQL block.
63.0	Demonstrate comprehension working with composite data types by writing executable script files. The student will be able to:
	63.01 Recognize the significance of the executable section and decide when to use it.
	63.02 Write statements in the executable section.
	63.03 Describe the rules of nested blocks.
	63.04 Identify and utilize appropriate coding conventions.

CTE Standards and Benchmarks
63.05 Create a script that will insert, update, merge and delete data in a table.

Florida Department of Education
Student Performance Standards

Course Title: **SQL Extension Languages I**
Course Number: **9007320**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to extensions of the SQL programming language.

CTE Standards and Benchmarks	
64.0	Describe the differences between SQL and SQL extension languages. The student will be able to:
64.01	Describe SQL extension languages.
64.02	Differentiate between SQL and SQL extension languages.
64.03	Explain the need for and benefits of SQL extension languages.
65.0	Create program blocks. The student will be able to:
65.01	Describe the structure of a program block.
65.02	Identify the different types of program blocks.
65.03	Identify program programming environments.
65.04	Create and execute an anonymous block.
65.05	Output messages in program blocks.
66.0	Use variables in program blocks. The student will be able to:
66.01	Describe how variables are used in program blocks.
66.02	Identify the syntax for using variables.
66.03	Declare and initialize variables.
66.04	Assign new values to variables.
67.0	Recognize lexical units. The student will be able to:
67.01	Describe the types of lexical units.
67.02	Describe identifiers and identify valid and invalid identifiers.
67.03	Describe and identify reserved words, delimiters, literals, and comments.

CTE Standards and Benchmarks	
68.0	Recognize data types. The student will be able to:
	68.01 Describe the data type categories.
	68.02 Give examples of scalar, composite, and large object (LOB) data types.
	68.03 Identify when an object becomes eligible for garbage collection.
69.0	Use scalar data types. The student will be able to:
	69.01 Declare and use scalar data types.
	69.02 Define guidelines for declaring and initializing variables.
70.0	Use various types of joins. The student will be able to:
	70.01 Construct and execute SELECT statements using an equijoin.
	70.02 Construct and execute SELECT statements using a non-equijoin.
	70.03 Construct and execute SELECT statements using an outer join.
	70.04 Construct and execute SELECT statements that result in cross join.
71.0	Use SQL group functions and subqueries. The student will be able to:
	71.01 Construct and execute an SQL query using group functions to determine a sum total, an average amount, and a maximum value.
	71.02 Construct and execute an SQL query that groups data based on specified criteria.
	71.03 Construct and execute an SQL query that contains a WHERE clause using a single-row subquery.
	71.04 Construct and execute an SQL query that contains a WHERE clause using a multiple-row subquery.
72.0	Write executable statements. The student will be able to:
	72.01 Construct variable assignment statements.
	72.02 Construct statements using built-in SQL functions.
	72.03 Differentiate between implicit and explicit data type conversions.
	72.04 Describe when implicit data type conversions take place.
	72.05 List the drawbacks of implicit data type conversions.
	72.06 Construct statements using functions to explicitly convert data types.
	72.07 Construct statements using operators.
73.0	Use nested blocks and variable scope. The student will be able to:

CTE Standards and Benchmarks	
	73.01 Understand the scope and visibility of variables.
	73.02 Write nested blocks and qualify variables with labels.
	73.03 Describe the scope of an exception.
	73.04 Describe the effect of exception propagation in nested blocks.
74.0	Use good programming practices. The student will be able to:
	74.01 List examples of good programming practices.
	74.02 Insert comments into code.
	74.03 Follow formatting guidelines when writing code.
75.0	Write DML statements to manipulate data. The student will be able to:
	75.01 Construct and execute a statement to insert data into a table.
	75.02 Construct and execute a statement to update data in a table.
	75.03 Construct and execute a statement to delete data from a table.
	75.04 Construct and execute a statement to merge data into a table.
76.0	Retrieve data. The student will be able to:
	76.01 Identify SQL statements that can be directly included in an executable block.
	76.02 Construct and execute an INTO clause to hold values returned by a single-row SELECT statement.
	76.03 Construct statements that retrieve data.
77.0	Manipulate data. The student will be able to:
	77.01 Describe when to use implicit or explicit cursors.
	77.02 Create code to use SQL implicit cursor attributes to evaluate cursor activity.
78.0	Use transaction control statements. The student will be able to:
	78.01 Define a transaction and give an example.
	78.02 Construct and execute a transaction control statement.
79.0	Use IF conditional control statements. The student will be able to:
	79.01 Construct and use an IF statement.
	79.02 Construct and use an IF -ELSIF statement.

CTE Standards and Benchmarks	
	79.03 Create control statements to handle NULL conditions in an IF statement.
80.0	Use CASE conditional control statements. The student will be able to:
	80.01 Construct and use CASE statements.
	80.02 Construct and use CASE expressions.
	80.03 Include syntax to handle NULL conditions in a CASE statement.
	80.04 Include syntax to handle Boolean conditions in IF and CASE statements.
81.0	Use basic LOOP iterative control statements. The student will be able to:
	81.01 Describe the types of LOOP statements and their uses.
	81.02 Create a program containing a basic loop and an EXIT statement.
	81.03 Create a program containing a basic loop and an EXIT statement with conditional termination.
82.0	Use WHILE and FOR loop iterative control statements. The student will be able to:
	82.01 Construct and use the WHILE looping construct.
	82.02 Construct and use the FOR looping construct.
	82.03 Describe when a WHILE loop is used.
	82.04 Describe when a FOR loop is used.
83.0	Use nested loop iterative control statements. The student will be able to:
	83.01 Construct and execute a program using nested loops.
	83.02 Evaluate a nested loop construct and identify the exit point.
84.0	Use explicit cursors. The student will be able to:
	84.01 List the guidelines for declaring and controlling explicit cursors.
	84.02 Create code to open a cursor and fetch a piece of data into a variable.
	84.03 Use a simple loop to fetch multiple rows from a cursor.
	84.04 Create code to close a cursor.
85.0	Use explicit cursor attributes. The student will be able to:
	85.01 Define a record structure.
	85.02 Create code to process the row of an active set using record types in cursors.

CTE Standards and Benchmarks	
	85.03 Use cursor attributes to retrieve information about the state of an explicit cursor.
86.0	Use cursor FOR loops. The student will be able to:
	86.01 List and explain the benefits of using a cursor FOR loops.
	86.02 Create code to declare a cursor and manipulate it in a FOR loop.
	86.03 Create code containing a cursor FOR loop using a subquery.
87.0	Use cursors with parameters. The student will be able to:
	87.01 List the benefits of using parameters with cursors.
	87.02 Create code to declare and manipulate a cursor with a parameter.
88.0	Use cursors for update transactions. The student will be able to:
	88.01 Create code to lock rows before an update using the appropriate clause.
	88.02 Explain the effect of using NOWAIT in an update cursor declaration.
	88.03 Create code to use the current row of the cursor in an UPDATE or DELETE statement.
89.0	Use multiple cursors. The student will be able to:
	89.01 Explain the need for using multiple cursors to produce multilevel reports.
	89.02 Create code to declare and manipulate multiple cursors within nested loops.
	89.03 Create code to declare and manipulate multiple cursors using parameters.
90.0	Handle exceptions. The student will be able to:
	90.01 Describe the advantages of including exception handling code.
	90.02 Describe the purpose of an EXCEPTION section in a program block.
	90.03 Create code to include an EXCEPTION section.
	90.04 List the guidelines for exception handling.
91.0	Trap server exceptions. The student will be able to:
	91.01 Distinguish between errors defined by the server and those defined by the programmer.
	91.02 Differentiate between errors that are handled implicitly and explicitly by the server.
	91.03 Write code to trap a predefined server error.
	91.04 Write code to trap a non-predefined server error.

CTE Standards and Benchmarks	
	91.05 Write code to identify an exception by error code and by error message.
92.0	Trap user-defined exceptions. The student will be able to:
	92.01 Write code to name a user-defined exception.
	92.02 Write code to raise an exception.
	92.03 Write code to handle a raised exception.

Florida Department of Education
Student Performance Standards

Course Title: **SQL Extension Languages II**
Course Number: **9007330**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to extensions of the SQL programming language.

CTE Standards and Benchmarks	
93.0	Create procedures. The student will be able to:
93.01	Differentiate between anonymous blocks and subprograms.
93.02	Identify the benefits of using subprograms.
93.03	Describe a stored procedure.
93.04	Create a procedure.
93.05	Describe how a stored procedure is invoked.
94.0	Use parameters in procedures. The student will be able to:
94.01	Describe how parameters contribute to a procedure.
94.02	Define a parameter.
94.03	Create a procedure using a parameter.
94.04	Invoke a procedure that has parameters.
94.05	Distinguish between formal and actual parameters.
95.0	Pass parameters. The student will be able to:
95.01	List the types of parameter modes.
95.02	Create a procedure that passes parameters.
95.03	Identify methods for passing parameters.
95.04	Describe the default option for parameters.
96.0	Create stored functions. The student will be able to:
96.01	Describe the difference between a stored procedure and a stored function.

CTE Standards and Benchmarks	
	96.02 Create a program block containing a function.
	96.03 Identify ways in which functions may be invoked.
	96.04 Create a program block that invokes a function that has parameters.
97.0	Use functions in SQL statements. The student will be able to:
	97.01 Describe where user-defined functions can be called from within an SQL statement.
	97.02 Describe the restrictions on calling functions from SQL statements.
	97.03 Describe the purpose of the Data Dictionary.
	97.04 Differentiate different types of Data Dictionary views.
	97.05 Write SQL SELECT statements to retrieve information from the Data Dictionary.
98.0	Manage procedures and functions. The student will be able to:
	98.01 Describe how exceptions are propagated.
	98.02 Remove a function and a procedure.
	98.03 Use Data Dictionary views to identify and manage stored procedures.
99.0	Manage object privileges. The student will be able to:
	99.01 List and explain several object privileges.
	99.02 Explain the function of the EXECUTE object privilege.
	99.03 Write SQL statements to grant and revoke object privileges.
100.0	Use invoker’s rights. The student will be able to:
	100.01 Contrast invoker’s rights with definer’s rights.
	100.02 Create a procedure that uses invoker’s rights.
101.0	Create packages. The student will be able to:
	101.01 Describe a package, its components, and the reasons for use.
	101.02 Create packages containing related variables, cursors, constants, exceptions, procedures, and functions.
	101.03 Create a program block that invokes a package construct.
102.0	Manage package constructs. The student will be able to:
	102.01 Explain the difference between public and private package constructs.

CTE Standards and Benchmarks	
	102.02 Designate a package construct as either public or private.
	102.03 Specify the syntax to drop a package.
	102.04 Identify Data Dictionary views used to manage packages.
	102.05 Identify the guidelines for using packages.
103.0	Use advanced package concepts. The student will be able to:
	103.01 Write packages that use the overloading feature.
	103.02 Write packages that use forward declarations.
	103.03 Explain the purpose of a package initialization block.
	103.04 Identify restrictions on using packaged functions in SQL statements.
104.0	Manage persistent state of package variables. The student will be able to:
	104.01 Identify persistent states of package variables.
	104.02 Control the persistent state of a package cursor.
105.0	Use vendor-supplied packages. The student will be able to:
	105.01 Describe common uses for vendor-supplied packages.
	105.02 Use the syntax to specify messages for a vendor-supplied package.
	105.03 Identify the exceptions used in conjunction with vendor-supplied packages.
106.0	Understand dynamic SQL. The student will be able to:
	106.01 Identify the stages through which all SQL statements pass.
	106.02 Describe the reasons for using dynamic SQL to create an SQL statement.
	106.03 List statements supporting Native Dynamic SQL.
107.0	Understand triggers. The student will be able to:
	107.01 Describe database triggers and their uses.
	107.02 Differentiate between a database trigger and an application trigger.
	107.03 List the guidelines for using triggers.
	107.04 Compare and contrast database triggers and stored procedures.
108.0	Create DML triggers. The student will be able to:

CTE Standards and Benchmarks	
	108.01 Create a DML trigger and identify its components.
	108.02 Create a statement level trigger.
	108.03 Describe the trigger firing sequence options.
	108.04 Create a DML trigger that uses conditional predicates.
	108.05 Create a row level trigger.
	108.06 Create a row level trigger that uses OLD and NEW qualifiers.
	108.07 Create an INSTEAD OF trigger.
109.0	Create DDL and database event triggers. The student will be able to:
	109.01 Describe the events that cause DDL and database event triggers to fire.
	109.02 Create a trigger for a DDL statement.
	109.03 Create a trigger for a database event.
	109.04 Describe the functionality of the CALL statement.
	109.05 Describe the cause of a mutating table.
110.0	Manage triggers. The student will be able to:
	110.01 View trigger information in the Data Dictionary.
	110.02 Disable and enable a database trigger.
	110.03 Remove a trigger from the database.
111.0	Use large object data types. The student will be able to:
	111.01 Compare and contrast LONG and LOB data types.
	111.02 Describe LOB data types and how they are used.
	111.03 Differentiate between internal and external LOBs.
	111.04 Create and maintain LOB data types.
	111.05 Migrate data from LONG to LOB.
112.0	Manage binary types. The student will be able to:
	112.01 Define binary column data type.
	112.02 Create directory objects and view them in the Data Dictionary.

CTE Standards and Benchmarks	
	112.03 Manage and manipulate binary types.
113.0	Manage indexes. The student will be able to:
	113.01 Create and manipulate user-defined records.
	113.02 Create an index.
	113.03 Describe the difference between records, tables, and indexes.
114.0	Manage dependencies. The student will be able to:
	114.01 Describe the implications of procedural dependencies.
	114.02 Contrast dependent objects and referenced objects.
	114.03 View dependency information in the Data Dictionary.
	114.04 Use a script to create the objects required to display dependencies.
	114.05 Use views to display dependencies.
	114.06 Describe how to minimize dependency failures.
115.0	Demonstrate an understanding of Agile Development. The student will be able to:
	115.01 Compare Agile project development to the waterfall approach.
	115.02 Describe the Agile manifesto and the 12 principles.
	115.03 Describe the benefits of Agile development.

Florida Department of Education
Student Performance Standards

Course Title: **Custom Database Programming**
Course Number: **9007340**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to specialized applications of the SQL programming language.

CTE Standards and Benchmarks	
116.0	Program a database application. The student will be able to:
116.01	Utilize loop statements.
116.02	Given a scenario, use arithmetic, comparison, and pattern-matching operators.
116.03	Create user-defined functions.
116.04	Utilize common built-in functions.
116.05	Declare variables in modules and procedures.
116.06	Declare arrays, and initialize elements of arrays.
116.07	Declare and use object variables and collections, and use their associated properties and methods.
116.08	Declare symbolic constants, and make them available locally or publicly.
116.09	Respond to events.
117.0	Utilize the basic concepts of database design. The student will be able to:
117.01	Apply basic concepts of normalization.
117.02	Utilize the cascade update and cascade delete options.
118.0	Utilize SQL and union queries. The student will be able to:
118.01	Utilize SQL to write common queries.
118.02	Refer to objects by using SQL.
118.03	Utilize union queries.
119.0	Implement program statements using objects. The student will be able to:
119.01	Determine when to use data access objects.

CTE Standards and Benchmarks	
	119.02 Differentiate between objects and collections.
	119.03 Write statements that access and modify database objects.
	119.04 Utilize data access objects.
	119.05 Select appropriate methods and property settings for use with specified objects.
120.0	Utilize debugging tools and write error handlers. The student will be able to:
	120.01 Trap errors.
	120.02 Utilize debugging tools to suspend program execution, and to examine, step through, and reset execution of code.
	120.03 Debug code samples.
	120.04 Utilize the Debugger to monitor variable values.
	120.05 Write an error handler.
121.0	Demonstrate file I/O. The student will be able to:
	121.01 Read from files.
	121.02 Write to files.
	121.03 Utilize record locking.
122.0	Create forms and identify all the properties of a form. The student will be able to:
	122.01 Choose form-specific and report-specific properties to set.
	122.02 Choose control properties to set.
	122.03 Assign event-handling procedures to controls in a form.
	122.04 Define and create form and report modules.
	122.05 Identify the scope of a form or report module.
	122.06 Open multiple instances of a form, and refer to them.
	122.07 Assign values to form properties.
	122.08 Use form methods.
123.0	Manipulate data using object models. The student will be able to:
	123.01 Connect to a data source.
	123.02 Open a recordset.

CTE Standards and Benchmarks	
	123.03 Insert, update, merge and delete data.
124.0	Develop custom controls. The student will be able to:
	124.01 Set properties for custom controls.
	124.02 Customize user interface controls.
125.0	Utilize API functions. The student will be able to:
	125.01 Properly declare functions.
	125.02 Use the by value and by reference parameters.
126.0	Demonstrate and implement database replication using programming tools. The student will be able to:
	126.01 Make a database replicable.
	126.02 View a synchronization schedule.
	126.03 Explain how synchronization conflicts are resolved.
	126.04 Identify the advantages of using replication of synchronization.
	126.05 Identify the changes that the database engine makes when it converts a nonreplicable database into replicable database.
127.0	Analyze and implement security options. The student will be able to:
	127.01 Analyze a scenario, and recommend an appropriate type of security.
	127.02 Explain the steps for implementing security.
	127.03 Analyze code to ensure that it sets security options.
	127.04 Write code to implement security options.
128.0	Implement client/server applications. The student will be able to:
	128.01 Demonstrate SQL pass through queries and application queries.
	128.02 Access external data.
	128.03 Trap errors that are generated by the server.
	128.04 Optimize connections.
	128.05 Optimize performance for a given client/server application.
129.0	Optimize the performance of a database. The student will be able to:
	129.01 Differentiate between single-field and multiple-field indexes.

CTE Standards and Benchmarks	
	129.02 Optimize queries.
	129.03 Restructure queries to allow faster execution.
	129.04 Optimize performance in distributed applications.
	129.05 Optimize performance for client/server applications.
130.0	Perform application distribution. The student will be able to:
	130.01 Prepare an application for distribution.
	130.02 Analyze various methods to distribute a client/server application.
	130.03 Distribute custom controls with an application.
	130.04 Provide online help.
131.0	Test and debug databases. The student will be able to:
	131.01 Implement error handling.
	131.02 Test and debug library databases.
132.0	Describe the difference between relational and NoSQL databases. The student will be able to:
	132.01 Describe the advantages and disadvantages of NoSQL databases.
	132.02 Describe the types of NoSQL databases (e.g., key-value store, column-based, graph-based, and document-based).
	132.03 Describe when a NoSQL database should be used for storage.
133.0	Demonstrate an understanding of Data Science and the concept of Data mining. The student will be able to:
	133.01 Define Data Science.
	133.02 Define Data Mining.
	133.03 Describe and compare Structured Data and Non-Structured Data.
	133.04 Describe and model the Data Science Life Cycle.
	133.05 Describe and compare various Deep Learning Frameworks available to Data Science.
	133.06 Describe and compare Data Science and Data Analytics.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **.NET Application Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9007400
CIP Number	0511020501
Grade Level	9-12
Program Length	7 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating .NET-based applications, including testing, monitoring, debugging, documenting, and maintaining .NET applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven (7) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
9007210	Foundations of Programming	BUS ED 1 @2 COMP SCI 6 COMP PROG 7 G	1 credit	15-1131	3	CT
9007220	Intermediate Programming		1 credit	15-1131	3	CT
9007230	Advanced Programming		1 credit	15-1131	3	CT
9007410	.NET Application Development Foundation		1 credit	15-1131	3	CT
9007420	.NET Application Development Applied		1 credit	15-1131	3	CT
9007430	.NET Application Development Capstone		1 credit	15-1131	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
11.0 Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development.
12.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical and logical data types.
13.0 Distinguish between iterative and non-iterative program control structures.
14.0 Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted and translated programming languages.
15.0 Describe the processes, methods, and conventions for software development and maintenance.
16.0 Explain the types, uses and limitations of testing for ensuring quality control.
17.0 Create a program design document using Unified Modeling Language (UML) or other common design tool.
18.0 Solve problems using critical thinking skills, creativity and innovation.
19.0 Use information technology tools.
20.0 Use security and privacy information.
21.0 Design a computer program to meet specific physical, operational and interaction criteria.
22.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
23.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate and process user input.
24.0 Effectively communicate and collaborate.
25.0 Demonstrate responsible use of technology and information.
26.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
27.0 Create a project plan that defines requirements, structural design, time estimates and testing elements.
28.0 Design, document, and create object-oriented computer programs.
29.0 Design a unit test plan for an object-oriented computer program, test and debug the program and report the results.
30.0 Understand human interactions in intelligence.
31.0 Develop an awareness of the changes taking place in the information age and how they fit into an evolving society.
32.0 Understand .NET primitive data types and their uses.

33.0 Describe the types and characteristics of lexical units in the .NET programming language.
34.0 Construct statements that use various .NET operators.
35.0 Construct and use .NET selection control structures.
36.0 Construct and use .NET iterative control structures.
37.0 Construct and use .NET structures for error handling.
38.0 Write .NET programs that define and use user-defined data types, including classes.
39.0 Write .NET programs that define and use methods.
40.0 Write programs that perform console input and output in a .NET program.
41.0 Use namespaces in a .NET program.
42.0 Use arrays in .NET programs.
43.0 Write .NET programs that use the object-oriented concept of inheritance.
44.0 Write .NET programs that use the object-oriented concept of polymorphism.
45.0 Write .NET programs that use the object-oriented concept of encapsulation.
46.0 Apply common programming style guidelines and conventions.
47.0 Use application life cycle management to develop and maintain .NET programs.
48.0 Use nullable values in a .NET program.
49.0 Use the .NET String and StringBuilder classes in an application.
50.0 Use .NET classes to perform stream input/output.
51.0 Use recursive functions to solve problems in .NET programs.
52.0 Write .NET programs that use interfaces.
53.0 Use .NET collections in applications.
54.0 Demonstrate knowledge of different types of .NET applications.
55.0 Demonstrate knowledge of .NET architecture and tools.
56.0 Demonstrate knowledge of web applications.
57.0 Develop webpages using HTML, CSS, JavaScript and ASP.NET.
58.0 Develop .NET Windows Form applications.
59.0 Develop Windows Service applications and class libraries.
60.0 Demonstrate knowledge of database applications.
61.0 Demonstrate knowledge of structured query language (SQL) statements.
62.0 Develop .NET database applications.
63.0 Successfully work as a member of a software development team.
64.0 Manage time according to a plan.
65.0 Keep acceptable records of progress problems and solutions.
66.0 Plan, organize, and carry out a project plan.
67.0 Manage resources.
68.0 Use tools, materials, and processes in an appropriate and safe manner.
69.0 Demonstrate an understanding of the software development process.
70.0 Research content related to the project and document the results following industry conventions.
71.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
72.0 Maintain Source Control for a Project.

73.0 Demonstrate competency in the area of expertise related to developing computer software using the .NET framework.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Programming**
Course Number: **9007210**
Course Credit: **1**

Course Description:

This course introduces concepts, techniques, and processes associated with computer programming and software development.

CTE Standards and Benchmarks	
10.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
10.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
10.02	Locate, organize, and reference written information from various sources.
10.03	Construct writings and/or communications using developmentally appropriate terminology.
10.04	Analyze the positive and negative impacts of technology on popular culture and personal life.
10.05	Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
10.06	Evaluate ways in which adaptive technologies may assist users with special needs.
10.07	Explain how societal and economic factors are affected by access to critical information.
10.08	Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
11.0	Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development. The student will be able to:
11.01	Explore a variety of careers to which computing is central.
11.02	Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization and cloud computing).
11.03	Evaluate the impacts of irresponsible use of information (e.g., plagiarism and falsification of data) on collaborative projects.
11.04	Identify tasks performed by programmers.
11.05	Describe how businesses use computer programming to solve business problems.
11.06	Investigate job opportunities in the programming field.
11.07	Explain different specializations and the related training in the computer programming field.
11.08	Explain the need for continuing education and training of computer programmers.

CTE Standards and Benchmarks	
	11.09 Understand and identify ways to use technology to support lifelong learning.
	11.10 Explain software as a service (SaaS) and how it impacts business.
	11.11 Describe ethical responsibilities of computer programmers.
	11.12 Identify credentials and certifications that may improve employability for a computer programmer.
	11.13 Identify devices, tools, and other environments for which programmers may develop software.
12.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical and logical data types. The student will be able to:
	12.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	12.02 Explain the types and uses of variables in programs.
	12.03 Determine the best data type to use for given programming problems.
	12.04 Compare and contrast simple data structures and their uses.
	12.05 Identify the types of operations that can be performed on different data types (e.g., math operations on numerical data types, concatenation and other string operations).
	12.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	12.07 Explain how computers store different data types in memory.
	12.08 Demonstrate the difference between "data" and "information".
	12.09 Use different number systems to represent data.
	12.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	12.11 Use Boolean logic to perform logical operations using Boolean algebra and truth tables.
13.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	13.01 Identify the uses of non-iterative and iterative programming structures.
	13.02 Create iterative programming structures and their uses (e.g., loops).
	13.03 Create non-iterative programming structures (e.g., conditionals, procedures).
	13.04 Explain how sequence, selection and iteration are building blocks of algorithms.
	13.05 Use pseudocode and flowcharts to write algorithms.
14.0	Describe the processes, methods and conventions for software development and maintenance. The student will be able to:
	14.01 Describe a software development process that is used to solve problems at different software development stages.
	14.02 Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).

CTE Standards and Benchmarks	
	14.03 List and explain the steps in the program development cycle.
	14.04 Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	14.05 Describe different methods used to facilitate version control.
15.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
	15.01 Explain the uses and limits of testing in ensuring program quality.
	15.02 Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	15.03 Describe and identify types of programming errors.
16.0	Create a program design document using common design tool. The student will be able to:
	16.01 Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	16.02 Describe and use tools for developing a program design (e.g., flowcharts, design documents, pseudocode).
	16.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	16.04 Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode).
	16.05 Develop a software artifact (independently and collaboratively) in phases (or stages) according to a common software development methodology (e.g., Waterfall or Spiral model).
	16.06 Define input and output for a program module using standard design methodology.
17.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	17.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	17.02 Employ critical thinking and collaborative skills to resolve conflicts.
	17.03 Identify and document workplace performance goals and monitor progress toward those goals.
	17.04 Conduct technical research to gather information necessary for decision-making.
	17.05 Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
18.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:
	18.01 Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity and privacy.
	18.02 Discuss the impact of government regulation on privacy and security.
	18.03 Describe how different types of software licenses (e.g., open source and proprietary licenses) can be used to share and protect

CTE Standards and Benchmarks		
		intellectual property.
	18.04	Explain how access to information may not include the right to distribute the information.
	18.05	Describe differences between open source, freeware, and proprietary software licenses and how they apply to different types of software.
	18.06	Discuss security and privacy issues that relate to computer networks.
	18.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts and harassment.
19.0	Create programs that solve a problem using non-iterative and iterative algorithms. The student will be able to:	
	19.01	Apply the developmental cycle methodologies to create a program.
	19.02	Develop a program using string and/or numeric data types.
	19.03	Develop a program using sequential algorithms.
	19.04	Develop a program using selection structures.
	19.05	Develop a program using looping structures.

Florida Department of Education
Student Performance Standards

Course Title: **Intermediate Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
20.0	Design a computer program to meet specific physical, operational and interaction criteria. The student will be able to:
20.01	Choose appropriate data types depending on the needs of the program.
20.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
20.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
20.04	Compare techniques for analyzing massive data collections.
20.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
20.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
20.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
20.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
21.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
21.01	Use appropriate naming conventions to define program variables and methods.
21.02	Use a program editor to write the source code for a program.
21.03	Write programs that use selection structures.
21.04	Write programs that use repetition structures.
21.05	Write programs that use nested structures.
21.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.

CTE Standards and Benchmarks	
	21.07 Compile, run, test and debug programs.
	21.08 Write programs that use standard arithmetic operators with different numerical data types.
	21.09 Write programs that use standard logic operators.
	21.10 Write programs that use a variety of common data types.
	21.11 Write programs that perform data conversion between numeric and string data types.
	21.12 Write programs that define, use, search and sort arrays.
	21.13 Write programs that use user-defined data types.
	21.14 Demonstrate understanding and use of appropriate variable scope.
	21.15 Use global and local scope appropriately in program implementation.
	21.16 Distinguish between binary and sequential searches.
22.0	Create and document an interactive computer program that employs functions, subroutines or methods to receive, validate and process user input. The student will be able to:
	22.01 Determine the results of code segments.
	22.02 Write programs that perform user input and output.
	22.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	22.04 Write program modules such as functions, subroutines, or methods.
	22.05 Write program modules that accept arguments.
	22.06 Write program modules that return values.
	22.07 Write program modules that validate arguments and return error codes.
	22.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	22.09 Use APIs and libraries to facilitate programming solutions.
	22.10 Participate in a peer code review to verify program functionality, programming styles, program usability and adherence to common programming standards.
	22.11 Explain how abstraction manages complexity.
23.0	Effectively communicate and collaborate. The student will be able to:
	23.01 Evaluate modes of communication and collaboration.
	23.02 Select appropriate tools within a project environment to communicate with project team members.
	23.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a

CTE Standards and Benchmarks	
	collaborative software project.
23.04	Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
23.05	Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
23.06	Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
24.0	Demonstrate responsible use of technology and information. The student will be able to:
24.01	Implement an encryption, digital signature or authentication method.
24.02	Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
24.03	Identify and explain the existence of biases in computer programming.
24.04	Explain how computing can play a role in social and political issues.
25.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
25.01	Differentiate between multiple levels of operating system, translation and interpretation that support program execution.
25.02	Explain the program execution process (by an interpreter and in CPU hardware).
25.03	Describe object-oriented concepts.
25.04	Explain the characteristics of procedural and object-oriented programming languages.
25.05	Compare and contrast programming languages that are compiled, interpreted and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Programming**
Course Number: **9007230**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing object-oriented programming techniques.

CTE Standards and Benchmarks	
26.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
26.01	Demonstrate the understanding and use of classes, objects, attributes and behaviors.
26.02	Demonstrate the understanding and use of inheritance.
26.03	Demonstrate the understanding and use of data encapsulation.
26.04	Demonstrate the understanding and use of polymorphism.
26.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
27.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates and testing elements. The student will be able to:
27.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program and testing it.
27.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements and other common components of a requirements document.
27.03	Design an object-oriented program using standard design methodology.
27.04	Work with other team members to develop a project plan for a program.
27.05	Work with other team members to write a design document for a program with multiple functions and shared data.
27.06	Participate in design meetings that review program design documents for conformance to program requirements.
27.07	Estimate the time to develop a program or module.
27.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets and by debugging).
28.0	Design, document, and create object-oriented computer programs. The student will be able to:
28.01	Compare and contrast recursive functions to other iterative methods.

CTE Standards and Benchmarks	
	28.02 Understand the implementation of character strings in the programming language.
	28.03 Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
	28.04 Write programs that implements user-defined data types.
	28.05 Decompose a problem by defining new functions and classes.
	28.06 Write object-oriented programs that implement inheritance.
	28.07 Write object-oriented programs that implement polymorphism.
	28.08 Develop class constructors.
	28.09 Write programs that define and use program constants.
	28.10 Write programs that perform error handling.
	28.11 Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity and conformance to program design documents.
	28.12 Describe the concept of parallel processing as a strategy to solve large problems.
	28.13 Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	28.14 Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	28.15 Write programs that are event-driven.
	28.16 Write programs that perform file input and output (i.e., sequential and random-access file input/output).
	28.17 Explain the value of heuristic algorithms to approximate solutions for unmanageable problems (e.g., a heuristic solution to Towers of Hanoi).
29.0	Design a unit test plan for an object-oriented computer program, test and debug the program and report the results. The student will be able to:
	29.01 Develop a test plan for an object-oriented program.
	29.02 Write test plans for programs that perform file input and output.
	29.03 Perform test and debug activities on object-oriented programs, including those written by someone else.
	29.04 Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	29.05 Document the findings of testing in a test report.
30.0	Understand human-AI interaction. The student will be able to:
	30.01 Describe the unique features of computers embedded in mobile devices and vehicles.
	30.02 Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.

CTE Standards and Benchmarks	
30.03	Describe the process of designing software to support specialized forms of human-computer interaction.
30.04	Explain the notion of intelligent behavior through computer modeling and robotics.
30.05	Describe common measurements of machine intelligence (e.g., Turing test).
30.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception, machine learning).
30.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space and automotive fields.

Florida Department of Education
Student Performance Standards

Course Title: **.NET Application Development Foundation**
Course Number: **9007410**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to the Internet and Internet-based software applications.

CTE Standards and Benchmarks	
31.0	Develop an awareness of the changes taking place in the information age and how they fit into an evolving society. The student will be able to:
31.01	Cite examples of jobs, salary and opportunities he/she will have as a .NET programmer.
31.02	Describe the role a database plays in a business.
31.03	Explain the value of middleware, such as the .NET framework, in developing software applications.
31.04	Understand the importance of clear communication when discussing business informational requirements.
32.0	Understand .NET primitive data types and their uses. The student will be able to:
32.01	Describe how variables are used in programs.
32.02	Identify the .NET built-in value types, their uses, and the ranges of values supported by each type.
32.03	Identify the default values for built-in value types.
32.04	Write statements that declare and initialize variables.
32.05	Write statements that assign literal values to numeric types.
32.06	Identify the .NET built-in reference types.
32.07	Write statements that assign string literals to string types.
32.08	Explain the memory size requirements for the various data storage types.
32.09	Identify which types are stored on the heap and which are stored on the stack.
32.10	Identify which data type should be used for a given purpose in a program.
32.11	Write statements that create variables with values that cannot be changed (i.e., const, final).
32.12	Identify the syntax for declaring and initializing each of the built-in data types.

CTE Standards and Benchmarks	
	32.13 Differentiate between implicit and explicit data type conversions.
	32.14 Describe when implicit data type conversions take place.
	32.15 Write statements that use explicit type conversion.
	32.16 List the drawbacks of implicit data type conversions.
	32.17 Compare and contrast boxing and unboxing.
	32.18 Describe the scope of a variable.
	32.19 Describe how the compiler uses scope to distinguish between variables with the same name.
33.0	Describe the types and characteristics of lexical units in the .NET programming language. The student will be able to:
	33.01 Describe the types of lexical units (e.g., keywords, directives, operators).
	33.02 Describe identifiers and identify valid and invalid identifiers.
	33.03 Describe and identify reserved words, delimiters, literals and comments.
34.0	Construct statements that use various .NET operators. The student will be able to:
	34.01 Construct statements using arithmetic operators.
	34.02 Construct statements using relational operators.
	34.03 Construct and use statements using logical operators.
	34.04 Construct and use statements using assignment operators.
	34.05 Construct and execute statements using operator precedence.
	34.06 Construct and execute statements using methods and fields of the Math class.
35.0	Construct and use .NET selection control structures. The student will be able to:
	35.01 Construct and use an if structure in a program.
	35.02 Construct and use an if/else structure in a program.
	35.03 Construct and use multiple-selection structures (e.g., switch, elseif, select) in programs.
	35.04 Construct and use nested selection structures in a program.
	35.05 Construct and use a conditional operator.
36.0	Construct and use .NET iterative control structures. The student will be able to:
	36.01 Describe the types of iterative control structures and their uses.

CTE Standards and Benchmarks	
	36.02 Construct and use a while structures (e.g., while, do/while, do/until) in a program.
	36.03 Construct and use a for structure in a program.
	36.04 Construct and use a control structure that iterates over each item in a collection (e.g., foreach, for/each/next).
	36.05 Describe the limits and advantages of different iterative control structure (i.e., while, do/while, for, foreach or for/each).
	36.06 Construct and use nested structures (iterative and selective) in a program.
	36.07 Write programs that alter the execution of program loops (e.g., break, continue, exit).
37.0	Construct and use .NET structures for error handling. The student will be able to:
	37.01 Describe the different types of software errors.
	37.02 Compare and contrast alternatives for handling errors.
	37.03 Write programs that validate user input and handle errors.
	37.04 Explain the correct method for using multiple catch blocks for exceptions.
	37.05 Explain the purpose of the finally block in exception handling.
	37.06 Write programs that handle exceptions using the try/catch/finally structure.
	37.07 Write programs with nested exception handling.
	37.08 Explain the concept of structured exception handling.
	37.09 Identify common exceptions and their causes.
	37.10 Explain the concept of throwing a new exception.
	37.11 Write programs that catch and re-throw exceptions.
	37.12 Write exception handlers that use characteristics of the exception argument in the program.
38.0	Write .NET programs that define and use user-defined data types, including classes. The student will be able to:
	38.01 Explain the concept of a user-defined data type.
	38.02 Distinguish between structures and classes.
	38.03 Identify the syntax for declaring enumerations and structures.
	38.04 Write programs that use declare and use enumerations.
	38.05 Write programs that declare and use structures.
	38.06 Explain the characteristics of different class constructs including instance variables, properties, fields, methods, events, object references and constructors.

CTE Standards and Benchmarks	
	38.07 Write programs that declare and use classes.
	38.08 Distinguish between different types of classes, including base class, derived class, abstract class, and sealed class.
	38.09 Explain the impact of using different access modifiers on user-defined data types.
	38.10 Use access modifiers in a program to control visibility to variables and user-defined data types.
	38.11 Explain the “this” reference and its uses.
39.0	Write .NET programs that define and use methods. The student will be able to:
	39.01 Identify the benefits of using methods.
	39.02 Describe the different types of class methods and their purposes.
	39.03 Create class methods that do and do not return values.
	39.04 Write statements that invoke a method.
	39.05 Create a method using arguments.
	39.06 Invoke a method that has arguments.
	39.07 Describe a method signature.
	39.08 Describe the purpose of overloading methods.
	39.09 Write programs that have overloaded methods.
	39.10 Define methods that have default arguments.
	39.11 Describe the conflict between overloaded methods and default arguments.
	39.12 Explain the impact of using different access modifiers on class methods.
	39.13 Write methods that use argument modifiers (e.g., out, ref, byref, byval, const).
40.0	Write programs that perform console input and output in a .NET program. The student will be able to:
	40.01 Use the Console class to read and write data from the console.
	40.02 Write statements that use escape sequences.
	40.03 Write statements that format string and numeric output.
	40.04 Write statements that use the ToString method to output data.
41.0	Use namespaces in a .NET program. The student will be able to:
	41.01 Compare and contrast assemblies and namespaces.

CTE Standards and Benchmarks	
	41.02 Describe the use of namespaces in .NET programming.
	41.03 Describe commonly used .NET namespaces (e.g., System, System.IO, System.Collections, System.Drawing).
	41.04 Identify the correct namespace to include for specified classes.
	41.05 Write programs that define a namespace.
	41.06 Create namespaces that abide by standard naming convention.
42.0	Use arrays in .NET programs. The student will be able to:
	42.01 Write statements to declare and initialize an array.
	42.02 Demonstrate the use of initializer lists.
	42.03 Write methods that take an array as an argument.
	42.04 Write methods that return an array to the calling method.
	42.05 Write statements to update and destroy arrays.
	42.06 Explain linear and binary searching.
	42.07 Use the static methods of the Array class to perform searches, binary searches and sorts.
	42.08 Demonstrate the use of multidimensional arrays.
	42.09 Demonstrate the use of jagged arrays (array of arrays).
43.0	Write .NET programs that use the object-oriented concept of inheritance. The student will be able to:
	43.01 Explain the purpose and use of inheritance in object-oriented programming.
	43.02 Compare and contrast single and multiple inheritance.
	43.03 Explain the purpose and implementation of classes that cannot serve as a base class (a sealed class).
	43.04 Describe has-a and is-a relationships.
	43.05 Create class hierarchies using inheritance.
	43.06 Declare and use a class derived from another class (implementing an is-a relationship).
	43.07 Declare and use a class where the derived class overrides methods of the base class.
	43.08 Declare and use a class that contains another class as a data member (implementing a has-a relationship).
	43.09 Write statements that determine at run time whether an instance of a class is derived from a specific base class or interface.
	43.10 Write statements that invoke a method of the base class from a derived class.

CTE Standards and Benchmarks	
	43.11 Identify which class methods can be inherited and which cannot.
	43.12 Explain how access modifiers affect the inheritance of class variables and methods.
44.0	Write .NET programs that use the object-oriented concept of polymorphism. The student will be able to:
	44.01 Explain the purpose and implementation of classes that cannot be instantiated (an abstract class).
	44.02 Explain the purpose and implementation of virtual class methods that must be overridden by derived classes.
	44.03 Explain the use of abstract classes in enforcing polymorphism.
	44.04 Create an abstract class.
	44.05 Create classes that derive from an abstract class.
	44.06 Create a program that uses polymorphism.
45.0	Write .NET programs that use the object-oriented concept of encapsulation. The student will be able to:
	45.01 Define and use classes that use access modifiers (e.g., private, public, protected, internal, internal protected) to provide encapsulation of data.
	45.02 Explain the restrictions on using accessibility levels.
	45.03 Compare and contrast different types of variable scope, including block, procedure, module/class and project scope.
	45.04 Compare and contrast different types of method scope, including public, private, protected, friend and protected friend.
	45.05 Write programs that use local variables.
	45.06 Describe the scope of a given variable.
	45.07 Describe how the compiler uses scope to distinguish between variables with the same name.
	45.08 Explain the purpose and use of static classes, variables and methods.
	45.09 Write programs that create and use static classes, variables and methods.
46.0	Apply common programming style guidelines and conventions. The student will be able to:
	46.01 List examples of good programming practices.
	46.02 Insert comments into code.
	46.03 Follow formatting guidelines when writing code.
	46.04 Define guidelines for declaring and initializing variables.
47.0	Use application life cycle management to develop and maintain .NET programs. The student will be able to:
	47.01 Describe the stages in the life cycle of an application.

CTE Standards and Benchmarks	
	47.02 Describe the different types of testing that are performed on an application.
	47.03 Describe the role of tools such as UML (Unified Modeling Language) in ensuring the integrity of the application.
	47.04 Describe different types of UML diagrams and guidelines for their use.
	47.05 Read an application specification and translate it into a working program.
	47.06 Describe the characteristics of different types of application development (e.g., Agile development).
	47.07 Describe different methods for deploying applications.
48.0	Use nullable values in a .NET program. The student will be able to:
	48.01 Describe the use of nullable value types.
	48.02 Describe the use of the null value in .NET programs.
	48.03 Write statements to declare and initialize nullable value types.
	48.04 Write statements to determine if a nullable value type currently has a value.

Florida Department of Education
Student Performance Standards

Course Title: .NET Application Development Applied
Course Number: 9007420
Course Credit: 1

Course Description:

This course continues the study of computer programming concepts specific to the Internet and Internet-based software applications.

CTE Standards and Benchmarks	
49.0	Use the .NET String and StringBuilder classes in an application. The student will be able to:
49.01	Compare and contrast the String and StringBuilder classes.
49.02	Identify the performance implications of using the String and StringBuilder classes for different purposes.
49.03	Use the methods of the String class to compare, search, format, split and join strings.
49.04	Use the methods of the String and StringBuilder classes to find, replace, delete and insert substrings.
49.05	Use the methods of the String class to translate a string into uppercase or lowercase.
49.06	Use culture information to modify strings.
50.0	Use .NET classes to perform stream input/output. The student will be able to:
50.01	Compare and contrast .NET classes used to perform file input/output (e.g., StreamReader, StreamWriter, StringReader, StringWriter, MemoryStream, BinaryReader, BinaryWriter).
50.02	Compare and contrast .NET classes used to manipulate files and directories (e.g., Directory, DirectoryInfo, File, FileInfo, Path).
50.03	Use .NET classes to search, add and delete directories.
50.04	Use .NET classes to search, add and delete files.
50.05	Use .NET classes to read and write text to a file.
50.06	Use .NET classes to read and write objects of a variety of types to a file.
50.07	Use .NET classes to read and write binary data to a file.
50.08	Compare and contrast .NET classes used to compress data (e.g., GZipStream, DeflateStream).
50.09	Use .NET classes to read and write compressed data to a file.
51.0	Use recursive functions to solve problems in .NET programs. The student will be able to:

CTE Standards and Benchmarks	
	51.01 Describe the use of recursive methods in solving problems.
	51.02 Describe the difference of iterative and recursive methods.
	51.03 Demonstrate the use of direct recursion.
	51.04 Demonstrate the use of indirect recursion.
52.0	Write .NET programs that use interfaces. The student will be able to:
	52.01 Describe interfaces and their use in .NET programming.
	52.02 Declare and use a class that implements a standard interface.
	52.03 Compare and contrast inheritance from a base class and inheritance of an interface.
	52.04 Identify common interfaces and their purposes (e.g., IComparable, IComparer, IEquatable, IDisposable, IFormattable, IConvertible).
	52.05 Define and use a custom interface.
	52.06 Write classes that implement common interfaces (e.g., IComparable, IComparer, IEquatable, IDisposable, IFormattable, IConvertible).
	52.07 Describe the program to interface principle and its benefits.
53.0	Use .NET collections in applications. The student will be able to:
	53.01 Compare and contrast common non-generic collection classes, including ArrayList, BitArray, HashTable, Queue, and Stack.
	53.02 Write programs that use common non-generic collection classes.
	53.03 Compare and contrast non-generic collection classes to generic collection classes.
	53.04 Compare and contrast common generic collection classes, including Dictionary, LinkedList, Queue, SortedDictionary, SortedList and Stack.
	53.05 Write programs that use common generic collection classes.
	53.06 Identify the collection class that is the best choice for different application requirements.
	53.07 Use iterators to access individual members of different types of collections.
	53.08 Use standard methods to add, delete, and modify members of different types of collections.
	53.09 Write statements to access members of a dictionary based on a key.
	53.10 Write statements to determine the existence of members of a dictionary based on a key or a value.
54.0	Demonstrate knowledge of different types of .NET applications. The student will be able to:
	54.01 Compare and contrast different types of .NET applications (e.g., Console, Windows Form, WPF, Windows Service, Class Library, web, database).
	54.02 Choose the best type of application to develop for a given application scenario.

CTE Standards and Benchmarks	
	54.03 Describe the characteristics and capabilities of a console application.
	54.04 Develop, test, and debug a console application.
	54.05 Write a console application that uses command-line arguments.
55.0	Demonstrate knowledge of .NET architecture and tools. The student will be able to:
	55.01 Describe components of the .NET architecture, including the Common Language Runtime (CLR), just-in-time (JIT) compiler, intermediate language (IL).
	55.02 Describe the steps required for a managed assembly to be built and run in the .NET environment.
	55.03 Compile single-file and multi-file assemblies using command-line tools.
	55.04 Describe common command-line tools used in developing .NET applications (e.g., Al.exe, Caspol.exe, Ildasm.exe, Makecert.exe, Sn,exe, Gacutil.ext,) and their purposes.
	55.05 Use a signing tool to sign an assembly.
	55.06 Use a disassembly tool to view the classes, members and methods of an assembly.
	55.07 Describe the garbage collection process.
56.0	Demonstrate knowledge of web applications. The student will be able to:
	56.01 Describe the web as a platform for applications.
	56.02 Compare and contrast static and dynamic content.
	56.03 Describe how webpages are loaded to a computer from the Internet including the hardware, software, servers and protocols required.
	56.04 Compare and contrast server-side and client-side programming.
	56.05 Describe how a web browser downloads and renders a webpage.
	56.06 Describe options and methodology for website deployment.
	56.07 Compare and contrast different web development technologies, including HTML, CSS, JavaScript, CGI scripts, XML and ASP.NET.
	56.08 Describe common webpages terminology (e.g., page life cycle, the webpages event model, webpage state management, cookies, virtual directories).
	56.09 Define the steps in the page life cycle of an ASP.NET webpage.
	56.10 Describe state management as it related to maintenance of page information.
	56.11 Describe how web services are accessed from a client application.
	56.12 Describe the PostBack mechanism for posting data to a webpage using ASP.NET 5.
	56.13 Describe the role of Internet Information Services (IIS).

CTE Standards and Benchmarks	
	56.14 Describe the role of Internet Service Providers (ISP) and the services they provide.
	56.15 Describe web services and related tools (e.g., Extensible Markup Language (XML), Simple Object Access Protocol (SOAP) and Web Service Definition Language (WSDL).
	56.16 Describe the characteristics and purposes of Application objects and Session objects that are maintained by the ASP.NET 5 run-time engine.
	56.17 Describe the common ASP.NET events for applications and sessions (i.e., application start, application end, application error, session start, session end).
	56.18 Describe entities that define standards for Internet applications (e.g., WS3, OASIS, WS-I).
57.0	Develop webpages using HTML, CSS, JavaScript, and ASP.NET. The student will be able to:
	57.01 Describe the characteristics and capabilities of a web application.
	57.02 Develop webpages using HTML (Hyper-text Markup Language) that include commonly used tags to define webpages with hyperlinks, tables, text, headings, images, backgrounds, and frames.
	57.03 Develop webpages using CSS (cascading style sheets) to define a uniform appearance across multiple webpages.
	57.04 Develop webpages using JavaScript to define and implement interactive content.
	57.05 Define and use functions in JavaScript.
	57.06 Define and use local and global variables using JavaScript.
	57.07 Use conditional operators in JavaScript to selectively perform specific function.
	57.08 Use Boolean conditions in JavaScript to selectively perform with multiple conditions.
	57.09 Use JavaScript loops to perform iteration.
	57.10 Use string objects and escape sequences in a JavaScript.
	57.11 Use JavaScript to access, use, and modify HTML elements.
	57.12 Use JavaScript to handle common events, including mouse events, key events and page events.
	57.13 Use JavaScript to create and manage forms within a webpage.
	57.14 Develop webpages that use ASP.NET to provide interactivity.
	57.15 Describe standards for making webpages accessible to individuals with disabilities.
	57.16 Develop webpages that conform to accessibility standards.
58.0	Develop .NET Windows Form applications. The student will be able to:
	58.01 Describe the characteristics and capabilities of a Windows Forms application.
	58.02 Compare and contrast common objects used in Windows Forms applications (e.g., Button, CheckBox, ColorDialog, ComboBox,

CTE Standards and Benchmarks	
	DateTimePicker, GroupBox, Label, LinkLabel, ListBox, MenuStrip, Panel, PicureBox, RadioButton, ToolTip).
58.03	Develop an interactive Windows Forms application that uses a variety of objects for input and output.
58.04	Perform data validation on input fields.
58.05	Describe the Windows Forms event model.
58.06	Create Windows Forms application that respond to common events, including mouse events, keyboard events, load events, click events, resize events and drag events.
58.07	Define Windows Forms applications with graphical user interfaces (GUI) that conform to appropriate usability guidelines.
58.08	Create Windows Forms applications that use Multiple Document Interface (MDI) and Single Document Interface (SDI).
58.09	Describe visual inheritance.
58.10	Develop a Windows Forms application that inherits a form from a base application.
59.0	Develop Windows Service applications and class libraries. The student will be able to:
59.01	Describe the characteristics and capabilities of a Windows Service application.
59.02	Describe the states in the lifetime of a service.
59.03	Describe the ServiceBase and ServiceController classes and their role in developing and controlling Windows Service applications.
59.04	Develop a Windows Service application.
59.05	Develop an installer for a Windows Service application.
59.06	Install and deploy a Windows Service application.
59.07	Test and debug a Windows Service application.
59.08	Uninstall a Windows Service application.
59.09	Develop, test and debug a Class Library.
60.0	Demonstrate knowledge of database applications. The student will be able to:
60.01	Explain common database terminology (e.g., relationships, normalization, fields, records, data integrity, referential integrity).
60.02	Describe the benefits and characteristics of relational databases.
60.03	Define primary keys and foreign keys and describe their purposes.
60.04	Explain how database design fits into the database application development process.
60.05	Translate an entity-relationship model into a relational database design.
60.06	Differentiate between one-to-one, one-to-many, and many-to-many relationships.

CTE Standards and Benchmarks	
	60.07 Move data from an unnormalized form through to a third normal form.
	60.08 Based on information requirements, define database tables that ensure data integrity and reduce redundant data.
	60.09 Describe routine maintenance for databases.
61.0	Demonstrate knowledge of structured query language (SQL) statements. The student will be able to:
	61.01 Describe the data manipulation language (DML) and describe various DML statements.
	61.02 List the capabilities of SQL SELECT statements.
	61.03 Write and execute a basic SELECT statement.
	61.04 Write and execute SELECT statements using the WHERE clause with common operators (i.e., =, <>, >, <, >=, <=, BETWEEN, LIKE, IN).
	61.05 Write and execute SELECT statements using the WHERE clause with logical operators, including AND and OR.
	61.06 Write and execute SELECT statements using the ORDER BY clause.
	61.07 Write and execute SELECT statements using wildcards.
	61.08 Write and execute UPDATE statements to modify rows in a table.
	61.09 Write and execute INSERT statements to insert rows into a table.
	61.10 Write and execute DELETE statements to delete rows in a table.
	61.11 Write and execute statements using JOIN to select data from two or more related tables.
	61.12 Write and execute statements that use SQL to perform common calculations (e.g., AVG, MAX, MIN, SUM).
62.0	Develop .NET database applications. The student will be able to:
	62.01 Describe the purpose of ActiveX Data Objects (ADO).
	62.02 Describe the purpose of the ADO connection object.
	62.03 Write statements to connect to a database.
	62.04 Write statements to open a database.
	62.05 Write statements to create a recordset.
	62.06 Write statements to commit a transaction to a database.
	62.07 Write statements to rollback a transaction to a database.
	62.08 Write statements to close a connection to a database.
	62.09 Develop, test and debug a database application.

CTE Standards and Benchmarks
62.10 Develop, test and debug a WPF application.
62.11 Understanding and querying a data source with LINQ.

Florida Department of Education
Student Performance Standards

Course Title: .NET Application Development Capstone
Course Number: 9007430
Course Credit: 1

Course Description:

This course continues the study of computer programming concepts specific to the Internet and Internet-based software applications.

CTE Standards and Benchmarks	
63.0	Successfully work as a member of a software development team. The student will be able to:
63.01	Accept responsibility for specific tasks in a given situation.
63.02	Document progress and provide feedback on work accomplished in a timely manner.
63.03	Complete assigned tasks in a timely and professional manner.
63.04	Reassign responsibilities when the need arises.
63.05	Complete daily tasks as assigned on one's own initiative.
64.0	Manage time according to a plan. The student will be able to:
64.01	Set realistic time frames and schedules.
64.02	Keep a written record of work accomplished on a daily basis.
64.03	Meet goals and objectives set by the team.
64.04	Identify individual priorities.
64.05	Complete a weekly evaluation of accomplishments and reevaluate goals, objectives and priorities, as needed.
65.0	Keep acceptable records of progress problems and solutions. The student will be able to:
65.01	Develop and use a record keeping system to record daily progress.
65.02	Use a project journal to identify problem statement.
65.03	Develop a portfolio of work accomplished to include requirements documents, design documents and UML, project and test plans and prototypes.
66.0	Plan, organize, and carry out a project plan. The student will be able to:
66.01	Identify a substantive problem that can be addressed with a .NET software solution.

CTE Standards and Benchmarks	
	66.02 Identify and document the potential customers for the project.
	66.03 Identify and document the customer requirements for the project including use case definitions.
	66.04 Document the proposed user interface for the project using common tools (e.g., mockups, event planning documents).
	66.05 Identify the hardware and software requirements for the project.
	66.06 Identify the programming tools required to develop the project.
	66.07 Write a detailed design document for the project.
	66.08 Write a detailed test plan for the project that addresses varying levels of testing including system testing and usability testing.
	66.09 Determine the scope of a project.
	66.10 Organize the team according to individual strengths.
	66.11 Assign specific tasks within a team.
	66.12 Determine project priorities.
	66.13 Identify required resources to complete the project.
	66.14 Plan, research, design, develop and evaluate activities, as required.
	66.15 Carry out the project plan to successful completion.
	66.16 Document design problems, test results, product defects and resolutions.
67.0	Manage resources. The student will be able to:
	67.01 Identify required resources for each stage of the project plan.
	67.02 Determine the methods needed to acquire needed resources.
	67.03 Demonstrate good judgment in the use of resources.
	67.04 Recycle and reuse resources where appropriate.
	67.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
68.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	68.01 Identify the proper tool for a given job.
	68.02 Use tools and machines in a safe manner.
	68.03 Adhere to laboratory or job site safety rules and procedures.
	68.04 Identify the application of processes appropriate to the task at hand.

CTE Standards and Benchmarks	
	68.05 Identify materials appropriate to their application.
69.0	Demonstrate an understanding of the software development process. The student will be able to:
	69.01 State the goals of the software application clearly.
	69.02 Identify and write a plan to achieve each goal.
	69.03 Develop a list of materials and content required for each goal.
	69.04 Develop a step-by-step procedure for developing the application.
	69.05 Follow a written procedure.
	69.06 Record data from evaluation activities.
	69.07 Document conclusions and solutions based on evaluation results, observations and data.
	69.08 Document progress using a project log.
	69.09 Write an abstract describing the project plan.
70.0	Research content related to the project and document the results following industry conventions. The student will be able to:
	70.01 Identify the basic research needed to develop the project plan.
	70.02 Identify available resources for completing background research required in the project plan.
	70.03 Demonstrate the ability to locate resource materials in a library, database, Internet and other research resources.
	70.04 Demonstrate the ability to organize information retrieval.
	70.05 Demonstrate the ability to prepare a topic outline.
	70.06 Write a draft of the research report.
	70.07 Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations, and references.
	70.08 Prepare an electronically composed research paper in proper form.
	70.09 Conduct an alpha and beta evaluation of the project's product.
	70.10 Write a report on the evaluations, documenting results, data, observations and design changes based on the results.
71.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
	71.01 Prepare a multi-media presentation on the completed project.
	71.02 Make an oral presentation about the project using the multi-media materials.
	71.03 Review the presentation and make changes in the delivery method(s) to improve presentation skills.

CTE Standards and Benchmarks	
72.0	Maintain Source Control for a Project. The student will be able to:
72.01	Limit the possibility of overwriting important files.
72.02	Apply version numbers to your files.
72.03	Archive older versions of a source-controlled file.
72.04	Keep track of who modified a file, when they modified it and what they modified.
73.0	Demonstrate competency in the area of expertise related to developing computer software using the .NET framework. The student will be able to:
73.01	Demonstrate a mastery of the content of the selected subject area.
73.02	Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
73.03	Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. The course title for Digital Information Technology (8207310) has been changed to Digital Business Foundations for the 2026-27 academic year.

Program Title: **Web Application Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9007500
CIP Number	0511020112
Grade Level	9-12
Program Length	7 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating web-based applications, including testing, monitoring, debugging, documenting, and maintaining applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven (7) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
8207310	Digital Business Foundations	DBF Teacher Certifications	1 credit	15-1151	2	CT
9007210	Foundations of Programming	BUS ED 1 @2 COMP SCI 6 COMP PROG 7 G	1 credit	15-1131	3	CT
9007220	Intermediate Programming		1 credit	15-1131	3	CT
9007230	Advanced Programming		1 credit	15-1131	3	CT
9007510	Web Programming		1 credit	15-1131	3	CT
9007520	JavaScript Programming		1 credit	15-1131	3	CT
9007530	PHP Programming		1 credit	15-1131	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

Digital Business Foundations (8207310) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 09.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate responsible, ethical, and effective behavior when using digital tools, resources, and networks.
02.0 Develop an awareness of personal and business computing systems.
03.0 Enhance communication and productivity skills.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance productivity and communication.
07.0 Demonstrate an understanding of a content management system (CMS).
08.0 Explore ways to research careers and plan for future goals.
09.0 Demonstrate leadership and team-building skills to enhance workplace performance and achieve organizational goals.
10.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
11.0 Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development.
12.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical and logical data types.
13.0 Distinguish between iterative and non-iterative program control structures.
14.0 Describe the processes, methods, and conventions for software development and maintenance.
15.0 Explain the types, uses, and limitations of testing for ensuring quality control.
16.0 Create a program design document using common design tool.
17.0 Solve problems using critical thinking skills, creativity and innovation.
18.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
19.0 Create programs that solve a problem using non-iterative and iterative algorithms.
20.0 Design a computer program to meet specific physical, operational and interaction criteria.
21.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
22.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate and process user input.
23.0 Effectively communicate and collaborate.
24.0 Demonstrate responsible use of technology and information.
25.0 Differentiate among procedural, object-oriented, compiled, interpreted and translated programming languages.
26.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
27.0 Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates and testing elements.
28.0 Design, document, and create object-oriented computer programs.
29.0 Design a unit test plan for an object-oriented computer program, test and debug the program and report the results.
30.0 Understand human-AI interaction.
31.0 Demonstrate proficiency using HTML and XHTML to create web content.

32.0 Demonstrate proficiency using cascading style sheets (CSS) to format webpages.
33.0 Demonstrate proficiency using basic client-side scripting to control the content and the behavior of HTML and XHTML documents.
34.0 Demonstrate an understanding of JavaScript programming fundamentals.
35.0 Demonstrate proficiency in assigning and handling variables in JavaScript programs and functions.
36.0 Use event handlers in JavaScript programs and functions.
37.0 Recognize and assign data types appropriate to their use.
38.0 Demonstrate proficiency in using appropriate operators to achieve a planned output.
39.0 Write executable statements.
40.0 Demonstrate an understanding of variable scope.
41.0 Use good programming practices.
42.0 Demonstrate use of the Document Object Module (DOM).
43.0 Use conditional control statements in JavaScript.
44.0 Use iterative control statements in JavaScript.
45.0 Use nested loop iterative control statements in JavaScript.
46.0 Use JavaScript to produce input and output for programs.
47.0 Demonstrate proficiency in using Form Objects in JavaScript programs and functions.
48.0 Demonstrate proficiency in using methods in JavaScript programs and functions.
49.0 Demonstrate proficiency in using parameters in JavaScript programs and functions.
50.0 Utilize debugging techniques in programs.
51.0 Recognize security risks in programs.
52.0 Use plug-ins and libraries.
53.0 Demonstrate proficiency in programming for mobile delivery technology (e.g., iPhone/Android).
54.0 Demonstrate an understanding of Personal Home Page (PHP) programming language.
55.0 Demonstrate proficiency in PHP configuration.
56.0 Demonstrate an understanding of PHP language basics.
57.0 Demonstrate proficiency in the use of server processes.
58.0 Demonstrate an understanding of object-oriented programming in PHP.
59.0 Demonstrate proficiency in writing PHP code to handle file input/output (I/O) operations.
60.0 Demonstrate proficiency in creating, populating, and using arrays in PHP.
61.0 Demonstrate proficiency handling strings in PHP.
62.0 Demonstrate proficiency in using PHP to access databases via Open Database Connectivity (ODBC).
63.0 Demonstrate proficiency in applying best practices for ensuring creation of a secure program.
64.0 Demonstrate an understanding of key technologies, protocols and architectures associated with web development and programming.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Business Foundations**
Course Number: **8207310**
Course Credit: **1**

Course Description:

This core course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information-based society. Digital Business Foundations includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design and the integration of these programs using software that meets industry standards.

Digital Business Foundations (8207310) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 09.0) have been placed in a separate document. To access this document, visit: Digital Business Foundations (8207310).

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Programming**
Course Number: **9007210**
Course Credit: **1**

Course Description:

This course introduces concepts, techniques, and processes associated with computer programming and software development.

CTE Standards and Benchmarks	
10.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
10.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
10.02	Locate, organize, and reference written information from various sources.
10.03	Construct writings and/or communications using developmentally appropriate terminology.
10.04	Analyze the positive and negative impacts of technology on popular culture and personal life.
10.05	Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
10.06	Evaluate ways in which adaptive technologies may assist users with special needs.
10.07	Explain how societal and economic factors are affected by access to critical information.
10.08	Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
11.0	Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development. The student will be able to:
11.01	Explore a variety of careers to which computing is central.
11.02	Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization and cloud computing).
11.03	Evaluate the impacts of irresponsible use of information (e.g., plagiarism and falsification of data) on collaborative projects.
11.04	Identify tasks performed by programmers.
11.05	Describe how businesses use computer programming to solve business problems.
11.06	Investigate job opportunities in the programming field.
11.07	Explain different specializations and the related training in the computer programming field.
11.08	Explain the need for continuing education and training of computer programmers.

CTE Standards and Benchmarks	
	11.09 Understand and identify ways to use technology to support lifelong learning.
	11.10 Explain software as a service (SaaS) and how it impacts business.
	11.11 Describe ethical responsibilities of computer programmers.
	11.12 Identify credentials and certifications that may improve employability for a computer programmer.
	11.13 Identify devices, tools, and other environments for which programmers may develop software.
12.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical and logical data types. The student will be able to:
	12.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	12.02 Explain the types and uses of variables in programs.
	12.03 Determine the best data type to use for given programming problems.
	12.04 Compare and contrast simple data structures and their uses.
	12.05 Identify the types of operations that can be performed on different data types (e.g., math operations on numerical data types, concatenation and other string operations).
	12.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	12.07 Explain how computers store different data types in memory.
	12.08 Demonstrate the difference between "data" and "information".
	12.09 Use different number systems to represent data.
	12.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	12.11 Use Boolean logic to perform logical operations using Boolean algebra and truth tables.
13.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	13.01 Identify the uses of non-iterative and iterative programming structures.
	13.02 Create iterative programming structures (e.g. Loops).
	13.03 Create non-interactive programming structures (e.g., conditionals; procedure).
	13.04 Explain how sequence, selection, and iteration are building blocks of algorithms.
	13.05 Use pseudocode and flowcharts to write algorithms.
14.0	Describe the processes, methods, and conventions for software development and maintenance. The student will be able to:
	14.01 Describe a software development process that is used to solve problems at different software development stages.
	14.02 Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).

CTE Standards and Benchmarks	
	14.03 List and explain the steps in the program development cycle.
	14.04 Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	14.05 Describe different methods used to facilitate version control.
15.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
	15.01 Explain the uses and limits of testing in ensuring program quality.
	15.02 Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	15.03 Describe and identify types of programming errors.
16.0	Create a program design document using common design tool. The student will be able to:
	16.01 Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	16.02 Describe and use tools for developing a program design (e.g., flowcharts, design documents, pseudocode).
	16.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	16.04 Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode).
	16.05 Develop a software artifact (independently and collaboratively) in phases (or stages) according to a common software development methodology (e.g., Waterfall or Spiral model).
	16.06 Define input and output for a program module using standard design methodology.
17.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	17.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	17.02 Employ critical thinking and collaborative skills to resolve conflicts.
	17.03 Identify and document workplace performance goals and monitor progress toward those goals.
	17.04 Conduct technical research to gather information necessary for decision-making.
	17.05 Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
18.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:
	18.01 Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	18.02 Discuss the impact of government regulation on privacy and security.
	18.03 Describe how different types of software licenses (e.g., open source and proprietary licenses) can be used to share and protect

CTE Standards and Benchmarks		
		intellectual property.
	18.04	Explain how access to information may not include the right to distribute the information.
	18.05	Describe differences between open source, freeware and proprietary software licenses, and how they apply to different types of software.
	18.06	Discuss security and privacy issues that relate to computer networks.
	18.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts and harassment.
19.0	Create programs that solve a problem using non-iterative and iterative algorithms. The student will be able to:	
	19.01	Apply the developmental cycle methodologies to create a program.
	19.02	Develop a program using string and/or numeric data types.
	19.03	Develop a program using sequential algorithms.
	19.04	Develop a program using selection structures.
	19.05	Develop a program using looping structures.

Florida Department of Education
Student Performance Standards

Course Title: **Intermediate Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
20.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:
20.01	Choose appropriate data types depending on the needs of the program.
20.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
20.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
20.04	Compare techniques for analyzing massive data collections.
20.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
20.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
20.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
20.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
21.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
21.01	Use appropriate naming conventions to define program variables and methods.
21.02	Use a program editor to write the source code for a program.
21.03	Write programs that use selection structures.
21.04	Write programs that use repetition structures.
21.05	Write programs that use nested structures.
21.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.

CTE Standards and Benchmarks	
	21.07 Compile, run, test and debug programs.
	21.08 Write programs that use standard arithmetic operators with different numerical data types.
	21.09 Write programs that use standard logic operators.
	21.10 Write programs that use a variety of common data types.
	21.11 Write programs that perform data conversion between numeric and string data types.
	21.12 Write programs that define, use, search and sort arrays.
	21.13 Write programs that use user-defined data types.
	21.14 Demonstrate understanding and use of appropriate variable scope.
	21.15 Use global and local scope appropriately in program implementation.
	21.16 Distinguish between binary and sequential searches.
22.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate and process user input. The student will be able to:
	22.01 Determine the results of code segments.
	22.02 Write programs that perform user input and output.
	22.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	22.04 Write program modules such as functions, subroutines or methods.
	22.05 Write program modules that accept arguments.
	22.06 Write program modules that return values.
	22.07 Write program modules that validate arguments and return error codes.
	22.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	22.09 Use APIs and libraries to facilitate programming solutions.
	22.10 Participate in a peer code review to verify program functionality, programming styles, program usability and adherence to common programming standards.
	22.11 Explain how abstraction manages complexity.
23.0	Effectively communicate and collaborate. The student will be able to:
	23.01 Evaluate modes of communication and collaboration.
	23.02 Select appropriate tools within a project environment to communicate with project team members.
	23.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a

CTE Standards and Benchmarks	
	collaborative software project.
23.04	Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
23.05	Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
23.06	Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
24.0	Demonstrate responsible use of technology and information. The student will be able to:
24.01	Implement an encryption, digital signature or authentication method.
24.02	Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
24.03	Identify and explain the existence of biases in computer programming.
24.04	Explain how computing can play a role in social and political issues.
25.0	Differentiate among procedural, object-oriented, compiled, interpreted and translated programming languages. The student will be able to:
25.01	Differentiate between multiple levels of operating system, translation and interpretation that support program execution.
25.02	Explain the program execution process (by an interpreter and in CPU hardware).
25.03	Describe object-oriented concepts.
25.04	Explain the characteristics of procedural and object-oriented programming languages.
25.05	Compare and contrast programming languages that are compiled, interpreted and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Programming**
Course Number: **9007230**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing object-oriented programming techniques.

CTE Standards and Benchmarks	
26.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
26.01	Demonstrate the understanding and use of classes, objects, attributes and behaviors.
26.02	Demonstrate the understanding and use of inheritance.
26.03	Demonstrate the understanding and use of data encapsulation.
26.04	Demonstrate the understanding and use of polymorphism.
26.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
27.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements. The student will be able to:
27.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it.
27.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements and other common components of a requirements document.
27.03	Design an object-oriented program using standard design methodology.
27.04	Work with other team members to develop a project plan for a program.
27.05	Work with other team members to write a design document for a program with multiple functions and shared data.
27.06	Participate in design meetings that review program design documents for conformance to program requirements.
27.07	Estimate the time to develop a program or module.
27.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
28.0	Design, document, and create object-oriented computer programs. The student will be able to:
28.01	Compare and contrast recursive functions to other iterative methods.

CTE Standards and Benchmarks	
	28.02 Understand the implementation of character strings in the programming language.
	28.03 Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
	28.04 Write programs that implements user-defined data types.
	28.05 Decompose a problem by defining new functions and classes.
	28.06 Write object-oriented programs that implement inheritance.
	28.07 Write object-oriented programs that implement polymorphism.
	28.08 Develop class constructors.
	28.09 Write programs that define and use program constants.
	28.10 Write programs that perform error handling.
	28.11 Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity, and conformance to program design documents.
	28.12 Describe the concept of parallel processing as a strategy to solve large problems.
	28.13 Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	28.14 Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	28.15 Write programs that are event-driven.
	28.16 Write programs that perform file input and output (i.e., sequential and random-access file input/output).
	28.17 Explain the value of heuristic algorithms to approximate solutions for unmanageable problems (e.g., a heuristic solution to Towers of Hanoi).
29.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:
	29.01 Develop a test plan for an object-oriented program.
	29.02 Write test plans for programs that perform file input and output.
	29.03 Perform test and debug activities on object-oriented programs, including those written by someone else.
	29.04 Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	29.05 Document the findings of testing in a test report.
30.0	Understand human-AI interaction. The student will be able to:
	30.01 Describe the unique features of computers embedded in mobile devices and vehicles.
	30.02 Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.

CTE Standards and Benchmarks	
30.03	Describe the process of designing software to support specialized forms of human-computer interaction.
30.04	Explain the notion of intelligent behavior through computer modeling and robotics.
30.05	Describe common measurements of machine intelligence (e.g., Turing test).
30.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception, machine learning).
30.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space and automotive fields.

Florida Department of Education
Student Performance Standards

Course Title: **Web Programming**
Course Number: **9007510**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to the Internet and Internet-based software applications.

CTE Standards and Benchmarks	
31.0	Demonstrate proficiency using HTML and XHTML to create web content. The student will be able to:
31.01	Use storyboarding techniques for designing a website (e.g., linear, hierarchical).
31.02	Identify elements of a webpage.
31.03	Create webpages using HTML and XHTML tags that create basic elements (e.g., links, lists, formatted text, tables).
31.04	Create webpages that utilize tables to achieve complex layout.
31.05	Add graphic content to webpages.
31.06	Create webpages that utilize client-side image maps.
31.07	Develop, integrate, and apply the use of forms in website design.
31.08	Optimize Web content for desirable search engine placement.
31.09	Demonstrate an understanding of browser compatibility issues by designing pages that comply with the current Web Content Accessibility Guidelines issued by the World Wide Web Consortium (W3C).
31.10	Demonstrate an understanding of Web accessibility issues by developing pages that meet Bobby accessibility checker criteria.
31.11	Explain basic XML syntax and how XHTML conforms to the XML standard.
31.12	Use a WYSIWYG editor to develop and manage a website.
31.13	Use markup validation tools to test HTML and XHTML documents for well-formed elements and make all corrections necessary to ensure compliance with W3C standards.
31.14	Analyze and modify HTML and XHTML source code developed by others.
32.0	Demonstrate proficiency using cascading style sheets (CSS) to format webpages. The student will be able to:
32.01	Explain the advantages and disadvantages of using Cascading Style Sheets (CSS) to format webpages.
32.02	Describe the difference between linked, embedded, imported and inline styles and explain how styles are inherited.

CTE Standards and Benchmarks	
	32.03 Explain the difference between classes, id, and span elements.
	32.04 Utilize CSS properties within webpages to control page layout, fonts, colors, backgrounds and other presentation effects.
	32.05 Demonstrate understanding of the Box Model.
	32.06 Demonstrate proficiency in creating 1 to 3 column layouts.
	32.07 Create navigation system through CSS.
33.0	Demonstrate proficiency using basic client-side scripting to control the content and the behavior of HTML and XHTML documents. The student will be able to:
	33.01 Describe the difference between server-side and client-side processing.
	33.02 Describe the term “scripting language” and explain how scripting languages differ from compiled languages.
	33.03 Create webpages that employ client-side scripting to control content and display.

Florida Department of Education
Student Performance Standards

Course Title: **JavaScript Programming**
Course Number: **9007520**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to client-side JavaScript.

CTE Standards and Benchmarks	
34.0	Demonstrate an understanding of JavaScript programming fundamentals. The student will be able to:
34.01	Describe server side versus client side applications including interpreters.
34.02	Describe the purpose and use of an interpreter in relation to JavaScript.
34.03	Describe differences in different types of JavaScript implementations (i.e., Jscript, ECMA).
34.04	Declare and initialize variables.
34.05	Assign new values to variables.
34.06	Create and use constant variables.
34.07	Describe the difference of programming languages versus scripting languages.
34.08	Describe object based nature and platform independence.
34.09	Describe and demonstrate inline scripting.
35.0	Demonstrate proficiency in assigning and handling variables in JavaScript programs and functions. The student will be able to:
35.01	Describe how variables are used in programs.
35.02	Identify which data type should be used for a given value.
35.03	Identify the syntax for using variables.
35.04	Declare and initialize variables.
35.05	Assign new values to variables.
35.06	Create and use constant variables.
35.07	Describe and demonstrate the use of properties.
35.08	Describe identifiers and identify valid and invalid identifiers.

CTE Standards and Benchmarks	
	35.09 Describe and identify reserved words, delimiters, literals and comments.
36.0	Use event handlers in JavaScript programs and functions. The student will be able to:
	36.01 Describe the event model and five events (form, image, map, link and window).
	36.02 Demonstrate and use the window events load, focus, blur and unload.
	36.03 Demonstrate and use the form events change, reset and submit.
	36.04 Demonstrate and use the text events cut, paste, select and copy.
	36.05 Demonstrate and use the mouse events mousemove, mousedown, click, mousewheel, mouseover, mouseout and mouseup.
	36.06 Demonstrate and use the keyboard events keyup, keydown and keypress.
	36.07 Demonstrate using the appropriate event handlers with their associated events.
37.0	Recognize and assign data types appropriate to their use. The student will be able to:
	37.01 Describe the data type categories.
	37.02 Give examples of var, primitives, null and undefined data types.
	37.03 Demonstrate the use of var in relation to other datatypes.
38.0	Demonstrate proficiency in using appropriate operators to achieve a planned output. The student will be able to:
	38.01 Construct statements using arithmetic operators.
	38.02 Construct statements using relational operators.
	38.03 Construct and use statements using logical operators.
	38.04 Construct and use statements using string concatenation and strict comparison.
	38.05 Construct and use statements using assignment operators.
	38.06 Construct and execute statements using operator precedence.
39.0	Write executable statements. The student will be able to:
	39.01 Construct variable assignment statements.
	39.02 Construct statements using built-in functions.
	39.03 Describe when implicit data type conversions take place.
	39.04 List the drawbacks of implicit data type conversions.
	39.05 Construct statements using functions to explicitly convert data types.

CTE Standards and Benchmarks	
40.0	Demonstrate an understanding of variable scope. The student will be able to:
40.01	Understand the scope and visibility of variables.
40.02	Write programs using local variables.
40.03	Describe the scope of a variable.
41.0	Use good programming practices. The student will be able to:
41.01	List examples of good programming practices.
41.02	Insert comments into code.
41.03	Demonstrate the use of <no script> tag.
41.04	Follow formatting guidelines when writing code.
41.05	Understand the different types of errors produced by programs.
42.0	Demonstrate use of the Document Object Module (DOM). The student will be able to:
42.01	Create and use user defined objects.
42.02	Create user defined objects with properties and methods.
42.03	Describe and Use the Array Object including its parameters, properties, and methods (chop, join, pop, push, splice, split).
42.04	Describe and Use the Date Object including its multiple constructors, properties, and methods (getDay, getMonth, getYear, getMinutes, getHous, getTime).
42.05	Describe and use the Window Object including \properties, and methods.
42.06	Describe and use the Image Object including its properties and methods.
42.07	Describe and use the History Object including its properties and methods.
42.08	Describe and use the RegEx Object for basic and complex regular expressions.
42.09	Describe and use the String Object including its properties and methods.
42.10	Describe and use the Math Object including its properties and methods.
43.0	Use conditional control statements in JavaScript. The student will be able to:
43.01	Construct and use an if statement.
43.02	Construct and use a switch statement.
43.03	Construct and use a while, do while and for loop.
43.04	Construct and use a conditional operator.

CTE Standards and Benchmarks	
44.0	Use iterative control statements in JavaScript. The student will be able to:
44.01	Describe the types of loop statements and their uses.
44.02	Construct and use the while and do while loop.
44.03	Construct and use the for loop.
44.04	Describe when a while loop is used.
44.05	Describe when a for loop is used.
45.0	Use nested loop iterative control statements in JavaScript. The student will be able to:
45.01	Construct and execute a program using nested loops.
45.02	Construct and execute a loop using break and continue.
45.03	Evaluate a nested loop construct and sentinel value.
46.0	Use JavaScript to produce input and output for programs. The student will be able to:
46.01	Describe and use the prompt() and confirm() to input data into programs.
46.02	Describe and demonstrate the use of the alert() to produce output to the console.
46.03	Describe and demonstrate how to input data using JavaScript Events.
46.04	Describe and demonstrate how to output using the document.write().
46.05	Explain the difference of prompt() and confirm() functions.
46.06	Create and use escape sequences.
47.0	Demonstrate proficiency in using Form Objects in JavaScript programs and functions. The student will be able to:
47.01	Use Form objects to validate input.
47.02	Access the value of the form object through its associated method.
47.03	Describe and use button, checkbox, textarea, select, radio, hidden, and text objects.
47.04	Access and modify values and attributes at runtime using getElementbyId, getElementsbyName, getElementsbyTagName, and inner HTML.
48.0	Demonstrate proficiency in using methods in JavaScript programs and functions. The student will be able to:
48.01	Differentiate between anonymous methods and methods.
48.02	Identify the benefits of using methods.
48.03	Describe and use inner method.

CTE Standards and Benchmarks	
	48.04 Create a method.
	48.05 Describe how a method is invoked.
49.0	Demonstrate proficiency in using parameters in JavaScript programs and functions. The student will be able to:
	49.01 Describe how parameters are passed into functions.
	49.02 Define a parameter.
	49.03 Create a method using a parameter.
	49.04 Invoke a method that has parameters.
	49.05 Distinguish between formal and actual parameters.
50.0	Utilize debugging techniques in programs. The student will be able to:
	50.01 Use the display property to enable/disable code blocks.
	50.02 Use document.write() to log program execution.
	50.03 Test program in different browsers and mobile devices for compatibility errors.
	50.04 Use comments as a flow control while debugging.
51.0	Recognize security risks in programs. The student will be able to:
	51.01 Describe the security risk of cookies and browsers.
	51.02 Identify security responsibilities of browsers and operating system.
	51.03 Describe security systems such as frame to frame URL changing.
	51.04 Describe the use of signed scripts.
	51.05 Create and use cookies in a secure manner.
52.0	Use plug-ins and libraries. The student will be able to:
	52.01 Use external libraries in the program.
	52.02 Describe and contrast the following industry libraries JQuerry, Dojo, LightBox, and Moo Tools, PhoneGap.
	52.03 Describe different types of libraries full, effects, tools, graphing, math, cryptography, and AJAX.
	52.04 Identify how load and reference external and user made scripts.
	52.05 Describe AJAX elements and procedures.
	52.06 Describe XML.

CTE Standards and Benchmarks	
	52.07 Demonstrate the use of XMLHttpRequest to retrieve data.
53.0	Demonstrate proficiency in programming for mobile delivery technology (e.g., iPhone/Android). The student will be able to:
	53.01 Respond to multi-touch and gesture events.
	53.02 Describe and demonstrate the use of webkit CSS.
	53.03 Use the meta tag to enable native look and feel.
	53.04 Create a splash screen.
	53.05 Describe and demonstrate app caching.
	53.06 Describe and demonstrate use of JQuery for mobile development.
	53.07 Describe how to publish the app using XCode.

Florida Department of Education
Student Performance Standards

Course Title: **PHP Programming**
Course Number: **9007530**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts specific to PHP programming.

CTE Standards and Benchmarks	
54.0	Demonstrate an understanding of Personal Home Page (PHP) programming language. The student will be able to:
54.01	Describe the evolution of PHP as a programming language.
54.02	Discuss the strengths and limitations of PHP.
55.0	Demonstrate proficiency in PHP configuration. The student will be able to:
55.01	Set up a PHP host (wamp, mamp, online).
55.02	Configure PHP for File Transfer Protocol (FTP) access.
55.03	Configure the config.php file.
56.0	Demonstrate an understanding of PHP language basics. The student will be able to:
56.01	Describe how variables are declared, referenced, and passed.
56.02	Describe the control structures inherent with PHP programming.
56.03	Describe the three types of arrays used in PHP.
56.04	Describe how functions in PHP are created, called, and controlled.
57.0	Demonstrate proficiency in the use of server processes. The student will be able to:
57.01	Describe a session and explain its importance and use in web programming.
57.02	Describe the server processes associated with forms handling.
57.03	Compare and contrast the use of GET and POST.
57.04	Describe cookies and explain their use, population, control, and risks.
57.05	Describe HTTP Headers and their role in web development.
57.06	Describe HTTP Authentication.

CTE Standards and Benchmarks	
58.0	Demonstrate an understanding of object-oriented programming in PHP. The student will be able to:
58.01	Create classes using PHP.
58.02	Describe inheritance and its role in PHP programming.
58.03	Write PHP code to handle exceptions.
58.04	Write PHP code to accommodate different interfaces.
59.0	Demonstrate proficiency in writing PHP code to handle file input/output (I/O) operations. The student will be able to:
59.01	Write PHP code to perform open, read, and write operations on files.
59.02	Write PHP code to initiate file system functions.
59.03	Write PHP code to handle streams.
60.0	Demonstrate proficiency in creating, populating, and using arrays in PHP. The student will be able to:
60.01	Create, populate and write code to extract information from a numeric array in PHP.
60.02	Create, populate and write code to extract information from an associative array in PHP.
60.03	Create, populate and write code to extract information from a multidimensional array in PHP.
61.0	Demonstrate proficiency handling strings in PHP. The student will be able to:
61.01	Write PHP code to retrieve or extract one or more characters from a string.
61.02	Write PHP code to convert a string from data type to another.
61.03	Write PHP code to manipulate the display characteristics of string data.
61.04	Write PHP code that uses string date to control program flow.
61.05	Write PHP code to join array elements with a string.
62.0	Demonstrate proficiency in using PHP to access databases via Open Database Connectivity (ODBC). The student will be able to:
62.01	Write PHP code to create an ODBC connection and retrieve information from a database using the appropriate Structured Query Language (SQL) statement.
62.02	Describe a prepared statement and discuss its primary advantages (e.g., code efficiency, SQL Injection prevention).
62.03	Create a prepared statement to perform specific SQL actions.
62.04	Describe a PHP Data Object (PDO) transaction and explain its primary advantages.
62.05	Create a prepared statement and associated result set using PDOStatement.
63.0	Demonstrate proficiency in applying best practices for ensuring creation of a secure program. The student will be able to:

CTE Standards and Benchmarks	
	63.01 Describe an SQL Injection, its consequences, and ways in which it may be prevented via programming.
	63.02 Describe the Remote Code Injection vulnerability in PHP and ways in which it may be prevented.
	63.03 Describe the risk of session hijacking in PHP and ways to program around it.
	63.04 Describe the risks associated with uploading files in PHP and ways in which risks might be mitigated.
	63.05 Describe Secure Sockets Layer (SSL) and usage issues related to PHP.
64.0	Demonstrate an understanding of key technologies, protocols, and architectures associated with web development and programming. The student will be able to:
	64.01 Describe SimpleXML functions.
	64.02 Describe Extensible Markup Language (XML) Extension.
	64.03 Describe XML Path Language (Xpath).
	64.04 Describe Web Services.
	64.05 Describe Simple Object Access Protocol (SOAP).
	64.06 Describe Representational State Transfer (REST).
	64.07 Describe JavaScript Object Notation (JSON).
	64.08 Describe Asynchronous JavaScript and XML (AJAX).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Computer Science Principles**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Career Preparatory	
Program Number	9007600
CIP Number	0511020316
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Course/Program Structure** section.
CTSO	FBLA, BPA, FL-TSA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialist 15-1131 – Computer Programmers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Computer Users Support Specialists, Computer Programmer Assistants, Computer Network Architects, and Computer Systems Analysts in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in computer programming, algorithms, program design structure, logical thinking, development methodologies, essential programming techniques, and implementation issues. Specialized programming skills involving advanced mathematical calculations and physics are also integrated into the curriculum

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course/Program Structure

This program is a planned sequence of instruction consisting of four (4) credits.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary course/program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
Course 1	9007610	Advanced Information Technology	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	1 credit	15-1151	3	CT
Course 2	9007210	Foundations of Programming	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	1 credit	15-1131	3	CT
Course 3 Options	9007220	Procedural Programming	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	1 credit	15-1131	3	CT
	0200335	*AP Computer Science Principles*	COMPU SCI 6 ANY FIELD WHEN CERT REFLECTS BACHELORS OR HIGHER	1 credit	15-1131	3	MA
Course 4 Options	9007230	Object-Oriented Programming Fundamentals**	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	1 credit	15-1131	3	CT
	0200320	*AP Computer Science A*	COMPU SCI 6 ANY FIELD WHEN CERT REFLECTS BACHELORS OR HIGHER	1 credit	15-1131	3	MA

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

**Students should have a strong procedural programming knowledge base prior to enrolling in this course. The Procedural Programming course (9007220) or *AP Computer Science Principles* course are recommended to provide this knowledge base.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.
05.04	Analyze information.

	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.
Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.

	10.01 Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
	10.02 Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
	11.01 Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
	11.02 Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
	11.03 Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
	11.04 Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
	12.01 Prioritize an occupation, credential and postsecondary training provider for plan formation.
	12.02 Self-assess progress toward meeting graduation requirements and skill-development goals.
	12.03 Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
	12.04 Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
	12.05 Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
	13.01 Identify online job posts relevant to his or her career aspirations.
	13.02 Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
	13.03 Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
	14.01 Develop a resume.
	14.02 Write a cover letter.
	14.03 Curate a professional portfolio that includes work products.
	14.04 Prepare for and experience a mock job interview.
15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.

15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Develop an awareness of microprocessors and digital computers.
02.0 Demonstrate an understanding of computer operating systems.
03.0 Demonstrate an understanding of global and local network systems.
04.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
05.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
06.0 Develop an awareness of emerging technologies.
07.0 Develop awareness of web development.
08.0 Demonstrate proficiency in physical computing with hardware devices or emulators.
09.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
10.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development.
11.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
12.0 Distinguish between iterative and non-iterative program control structures.
13.0 Describe the processes, methods, and conventions for software development and maintenance.
14.0 Explain the types, uses, and limitations of testing for ensuring quality control.
15.0 Create a program design document using common design tool.
16.0 Solve problems using critical thinking skills, creativity and innovation.
17.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
18.0 Create programs that solve a problem using non-iterative and iterative algorithms.
19.0 Design a computer program to meet specific physical, operational, and interaction criteria.
20.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
21.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.
22.0 Effectively communicate and collaborate.
23.0 Demonstrate responsible use of technology and information.
24.0 Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages.
25.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
26.0 Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements.
27.0 Design, document, and create object-oriented computer programs.
28.0 Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results.
29.0 Understand human-AI interaction.

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Information Technology**
Course Number: **9007610**
Course Credit: **1**

Course Description:

This course provides a basic overview of current business and information systems and their trends. Students gain fundamental knowledge and experience in computer technology that is required for today's business and academic environments. With the development of basic computer science knowledge and understanding, this course prepares students to be successful both personally and professionally in an information-based society. Advanced Information Technology includes industry-driven standards that allow student exploration of computers and their networks, as well as other emergent technology, hardware/software installation and functionality, web development practices, and the benefits and risks of using computers both locally and globally.

CTE Standards and Benchmarks	
01.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
01.01	Explain the general architecture of a microcomputer system.
01.02	Explain the need for and use of peripherals (e.g., keyboards, sensory input, geospatial input).
01.03	Demonstrate proficiency using peripherals.
01.04	Differentiate between diagnosing and troubleshooting peripherals.
01.05	Describe the necessary components for data storage and memory, and how it affects programming (e.g., RAM, ROM).
01.06	Differentiate between multiple levels of hardware and software (e.g., CPU hardware, operating system, translation, interpretation) that support program execution.
01.07	Evaluate various forms of input and output (e.g., IO, storage devices, digital media).
02.0	Demonstrate an understanding of computer operating systems. The student will be able to:
02.01	Identify various types of computer operating systems.
02.02	Compare and contrast various types of computer operating systems.
02.03	Describe the evolution of computer operating systems.
02.04	Compare and contrast different computer system viruses and how they affect various computer operating systems.
02.05	Understand the advantages and disadvantages of open-source computer operating systems.
03.0	Demonstrate an understanding of global and local network systems. The student will be able to:
03.01	Identify types of networks and how they work.

CTE Standards and Benchmarks	
	03.02 Identify the role of servers and clients on a network.
	03.03 Identify benefits and risks of networked computing.
	03.04 Identify the relationship between computer networks and other communications networks (e.g., Wi-Fi, teleconference, telepresence).
	03.05 Identify intranets, extranets and how they relate to the Internet.
	03.06 Describe how the Internet facilitates global communication.
04.0	Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. The student will be able to:
	04.01 Demonstrate awareness of the following workplace essentials: quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming.
	04.02 Demonstrate ways of providing and accepting constructive criticism on collaborative projects within the workplace.
	04.03 Apply appropriate collaborative skills to manage and resolve conflicts in work situations.
	04.04 Demonstrate human relations, personal and interpersonal skills appropriate for the workplace, including responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress.
	04.05 Discuss and analyze the impact of values and points of view that are presented in media message (e.g., racial, gender, political, biases).
05.0	Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication. The student will be able to:
	05.01 Demonstrate how to connect to the Internet and use appropriate Internet protocol.
	05.02 Identify and describe web terminology, addresses and how browsers work.
	05.03 Describe appropriate browser security configurations.
	05.04 Understand and apply level one Universal Resource Locator (URL) and associated protocols (e.g., com, org, edu, gov, net, mil).
	05.05 Evaluate quality of digital resources for reliability (e.g., currency, relevancy, authority, accuracy, purpose of digital information).
	05.06 Compare and contrast techniques for analyzing massive data collections.
06.0	Develop an awareness of emerging technologies. The student will be able to:
	06.01 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless network, tablets, cell phones, satellite technology, nanotechnology, smart devices, home networks, peer-to-peer).
	06.02 Describe how digital tools and resources are used in today's society (i.e., efficiency and effectiveness, individual and collaborative use).
	06.03 Explain different file types used for various purposes based on file size and data input (e.g., word processing, images, music, three-dimensional drawings).
	06.04 Develop criteria for selecting appropriate hardware and software when solving a specific real-world problem.

CTE Standards and Benchmarks	
	06.05 Define scale-ability as it relates to emerging technology.
07.0	Develop awareness of web development. The student will be able to:
	07.01 Define basic terminology used in web page development.
	07.02 Create web pages using HTML tags (e.g., headings, character styles, paragraphs, text alignments, lists, images)
	07.03 Describe the purpose of storyboarding techniques.
	07.04 Describe the basic functions of WYSIWYG editors.
	07.05 Create a simple example of wire framing with, at least, three web pages.
	07.06 Explain the use of Cascading Style Sheets.
	07.07 Apply the use of Cascading Style Sheets in a web page.
	07.08 Test web pages for display, functionality, and accessibility before publishing a site to the Internet (i.e., validate web page code using W3C validation tool).
	07.09 Discuss issues related to using music, videos, or images from the Internet on your website (e.g., ethical use, illegal use, Creative Commons).
08.0	Demonstrate proficiency in physical computing with hardware devices or emulators. The student will be able to:
	08.01 View hardware as an approachable and fun topic in computing. *Physical computing is meant to encourage interdisciplinary and entrepreneurial thinking and foster student creativity.*
	08.02 Demonstrate the use of Physical computing, which is about the interaction between the person and the machine.
	08.03 Use physical computing devices or emulators to solve problems.
	08.04 Determine how computers sense and respond to their environment.
	08.05 Determine the kind of information that can be communicated with hardware outputs.
	08.06 Analyze how simple hardware can be used to develop innovative new products.
	08.07 Define prototype in relation to digital design.
	08.08 Create a prototype of an original game that can be played using a physical computing device.
	08.09 Design a prototype of an original device that can be used to assist someone with a physical challenge.

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Programming**
Course Number: **9007210**
Course Credit: **1**

Course Description:

This course introduces concepts, techniques, and processes associated with computer programming and software development.

CTE Standards and Benchmarks	
09.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
09.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
09.02	Locate, organize and reference written information from various sources.
09.03	Construct writings and/or communications using developmentally appropriate terminology.
09.04	Analyze the positive and negative impacts of technology on popular culture and personal life.
09.05	Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
09.06	Evaluate ways in which adaptive technologies may assist users with special needs.
09.07	Explain how societal and economic factors are affected by access to critical information.
09.08	Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
10.0	Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to:
10.01	Explore a variety of careers to which computing is central.
10.02	Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, and cloud computing).
10.03	Evaluate the impacts of irresponsible use of information (e.g., plagiarism and falsification of data) on collaborative projects.
10.04	Identify tasks performed by programmers.
10.05	Describe how businesses use computer programming to solve business problems.
10.06	Investigate job opportunities in the programming field.
10.07	Explain different specializations and the related training in the computer programming field.
10.08	Explain the need for continuing education and training of computer programmers.

CTE Standards and Benchmarks	
	10.09 Understand and identify ways to use technology to support lifelong learning.
	10.10 Explain software as a service (SaaS) and how it impacts business.
	10.11 Describe ethical responsibilities of computer programmers.
	10.12 Identify credentials and certifications that may improve employability for a computer programmer.
	10.13 Identify devices, tools, and other environments for which programmers may develop software.
11.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to:
	11.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	11.02 Explain the types and uses of variables in programs.
	11.03 Determine the best data type to use for given programming problems.
	11.04 Compare and contrast simple data structures and their uses.
	11.05 Identify the types of operations that can be performed on different data types (e.g., math operations on numerical data types, concatenation, and other string operations).
	11.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	11.07 Explain how computers store different data types in memory.
	11.08 Demonstrate the difference between "data" and "information".
	11.09 Use different number systems to represent data.
	11.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	11.11 Use Boolean logic to perform logical operations using Boolean algebra and truth tables.
12.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	12.01 Identify the uses of non-iterative and iterative programming structures using pseudocode and flowcharts.
	12.02 Create iterative programming structures and their uses.
	12.03 Explain how sequence, selection, and iteration are building blocks of algorithms.
13.0	Describe the processes, methods, and conventions for software development and maintenance. The student will be able to:
	13.01 Describe a software development process that is used to solve problems at different software development stages.
	13.02 Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).
	13.03 List and explain the steps in the program development cycle.
	13.04 Describe different types of documentation used in the program development cycle (*e.g.*, requirements document, program design documents, test plans).

CTE Standards and Benchmarks	
	13.05 Describe different methods used to facilitate version control.
14.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
	14.01 Explain the uses and limits of testing in ensuring program quality.
	14.02 Explain testing performed at different stages of the program development cycle (*e.g.,* unit testing, system testing, user acceptance testing).
	14.03 Describe and identify types of programming errors.
15.0	Create a program design document using common design tool. The student will be able to:
	15.01 Describe different design methodologies and their uses (*e.g.*, object-oriented design, structured design, rapid application development).
	15.02 Describe and use tools for developing a program design (*e.g.*, flowcharts, design documents, pseudocode).
	15.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	15.04 Participate and contribute to a design review of a program design developed using a common program design tool (*e.g.*, UML, flowcharts, design documents, pseudocode).
	15.05 Develop a software artifact (independently and collaboratively) in phases (or stages) according to a common software development methodology (e.g., Waterfall or Spiral model).
	15.06 Define input and output for a program module using standard design methodology.
16.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	16.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	16.02 Employ critical thinking and collaborative skills to resolve conflicts.
	16.03 Identify and document workplace performance goals and monitor progress toward those goals.
	16.04 Conduct technical research to gather information necessary for decision-making.
	16.05 Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
17.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:
	17.01 Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	17.02 Discuss the impact of government regulation on privacy and security.
	17.03 Describe how different types of software licenses (e.g., open source and proprietary licenses) can be used to share and protect intellectual property.
	17.04 Explain how access to information may not include the right to distribute the information.
	17.05 Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software.

CTE Standards and Benchmarks	
	17.06 Discuss security and privacy issues that relate to computer networks.
	17.07 Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
18.0	Create programs that solve a problem using non-iterative and iterative algorithms. The student will be able to:
	18.01 Apply the developmental cycle methodologies to create a program.
	18.02 Develop a program using string and/or numeric data types.
	18.03 Develop a program using sequential algorithms.
	18.04 Develop a program using selection structures.
	18.05 Develop a program using looping structures.

Florida Department of Education
Student Performance Standards

Course Title: **Procedural Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
19.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:
19.01	Choose appropriate data types depending on the needs of the program.
19.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
19.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
19.04	Compare techniques for analyzing massive data collections.
19.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
19.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
19.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
19.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
20.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
20.01	Use appropriate naming conventions to define program variables and methods.
20.02	Use a program editor to write the source code for a program.
20.03	Write programs that use selection structures.
20.04	Write programs that use repetition structures.
20.05	Write programs that use nested structures.
20.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.

CTE Standards and Benchmarks	
	20.07 Compile, run, test and debug programs.
	20.08 Write programs that use standard arithmetic operators with different numerical data types.
	20.09 Write programs that use standard logic operators.
	20.10 Write programs that use a variety of common data types.
	20.11 Write programs that perform data conversion between numeric and string data types.
	20.12 Write programs that define, use, search, and sort arrays.
	20.13 Write programs that use user-defined data types.
	20.14 Demonstrate understanding and use of appropriate variable scope.
	20.15 Use global and local scope appropriately in program implementation.
	20.16 Distinguish between binary and sequential searches.
21.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	21.01 Determine the results of code segments.
	21.02 Write programs that perform user input and output.
	21.03 Write programs that validate user input (*e.g.*, range checking, data formats, valid/invalid characters).
	21.04 Write program modules such as functions, subroutines, or methods.
	21.05 Write program modules that accept arguments.
	21.06 Write program modules that return values.
	21.07 Write program modules that validate arguments and return error codes.
	21.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	21.09 Use APIs and libraries to facilitate programming solutions.
	21.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
	21.11 Explain how abstraction manages complexity.
22.0	Effectively communicate and collaborate. The student will be able to:
	22.01 Evaluate modes of communication and collaboration.
	22.02 Select appropriate tools within a project environment to communicate with project team members.
	22.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project.

CTE Standards and Benchmarks	
	22.04 Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
	22.05 Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
	22.06 Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
23.0	Demonstrate responsible use of technology and information. The student will be able to:
	23.01 Implement an encryption, digital signature, or authentication method.
	23.02 Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
	23.03 Identify and explain the existence of biases in computer programming.
	23.04 Explain how computing can play a role in social and political issues.
24.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
	24.01 Differentiate between multiple levels of operating system, translation, and interpretation that support program execution.
	24.02 Explain the program execution process (by an interpreter and in CPU hardware).
	24.03 Describe object-oriented concepts.
	24.04 Explain the characteristics of procedural and object-oriented programming languages.
	24.05 Compare and contrast programming languages that are compiled, interpreted, and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Object-Oriented Programming Fundamentals**
Course Number: **9007230**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing object-oriented programming techniques.

CTE Standards and Benchmarks	
25.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
25.01	Demonstrate the understanding and use of classes, objects, attributes, and behaviors.
25.02	Demonstrate the understanding and use of inheritance.
25.03	Demonstrate the understanding and use of data encapsulation.
25.04	Demonstrate the understanding and use of polymorphism.
25.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
26.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements. The student will be able to:
26.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it.
26.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements, and other common components of a requirements document.
26.03	Design an object-oriented program using standard design methodology.
26.04	Work with other team members to develop a project plan for a program.
26.05	Work with other team members to write a design document for a program with multiple functions and shared data.
26.06	Participate in design meetings that review program design documents for conformance to program requirements.
26.07	Estimate the time to develop a program or module.
26.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
27.0	Design, document, and create object-oriented computer programs. The student will be able to:
27.01	Compare and contrast recursive functions to other iterative methods.

CTE Standards and Benchmarks	
	27.02 Understand the implementation of character strings in the programming language.
	27.03 Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
	27.04 Write programs that implements user-defined data types.
	27.05 Decompose a problem by defining new functions and classes.
	27.06 Write object-oriented programs that implement inheritance.
	27.07 Write object-oriented programs that implement polymorphism.
	27.08 Develop class constructors.
	27.09 Write programs that define and use program constants.
	27.10 Write programs that perform error handling.
	27.11 Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity, and conformance to program design documents.
	27.12 Describe the concept of parallel processing as a strategy to solve large problems.
	27.13 Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	27.14 Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	27.15 Write programs that are event-driven.
	27.16 Write programs that perform file input and output (i.e., sequential and random-access file input/output).
	27.17 Explain the value of heuristic algorithms to approximate solutions for unmanageable problems (e.g., a heuristic solution to Towers of Hanoi).
28.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:
	28.01 Develop a test plan for an object-oriented program.
	28.02 Write test plans for programs that perform file input and output.
	28.03 Perform test and debug activities on object-oriented programs, including those written by someone else.
	28.04 Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	28.05 Document the findings of testing in a test report.
29.0	Understand human-AI interaction. The student will be able to:
	29.01 Describe the unique features of computers embedded in mobile devices and vehicles.
	29.02 Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.

CTE Standards and Benchmarks	
29.03	Describe the process of designing software to support specialized forms of human-computer interaction.
29.04	Explain the notion of intelligent behavior through computer modeling and robotics.
29.05	Describe common measurements of machine intelligence (e.g., Turing test).
29.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception, machine learning).
29.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space, and automotive fields.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org .

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Data Science and Machine Learning**
Program Type: **Non-Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Non-Career Preparatory	
Program Number	9007700
CIP Number	0530700101
Grade Level	9-12
Program Length	4 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FL-TSA, SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and Data Analytics and Data Science-enabled careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Artificial Intelligence (AI) and Machine Learning required for such data professionals working on business and academic environments in the Information Technology career cluster. The intention of this course is to prepare students to be successful both personally and professionally in an increasingly data-focused society that demands more thorough data understanding and fluent analytic skills.

The content includes to fundamental understanding and application of data analytics, data visualization, relational database design, machine learning, societal impacts of AI/ML, AI/ML systems and their components, problems and tools AI-enabled workers use to build models and systems that leverage data to make decisions, and mastery of foundational skills required to become power ML/AI users. In addition, the course content includes but is not limited to practical experiences in AI/ML system design, deployment, and evaluation; problem identification; creation, selection, and curation of data sets; computer programming, use of machine learning algorithms, program design structure, evaluation of the societal impact of AI, employing ethical and responsible development methodologies and decision making, essential programming techniques, and implementation issues. Specialized programming skills involving advanced mathematical calculations and statistics are also integrated into the curriculum.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 4 credits.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Sequence	Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
Course 1 Options	9007710	Foundations of Programming for Data Science and Artificial Intelligence	BUS ED 1@2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G COMP PROG 7G ENG 7G EG TEC 7G TECH ED 1 @2 ENG & TEC ED 1@2 MATH 6-12 Agriculture (6-12) Computer Science (K12) Business Education (6-12) Engineering and Technology Education (6-12)	1 credit	3	CT
	9007220	Intermediate Programming	BUS ED 1@2 COMPU SCI 6 COMP PROG 7G	1 credit	3	CT
Course 2	9007720	Data Analytics and Database Design	Refer to the first two courses for the Teacher Certifications	1 credit	3	CT
Course 3	9007730	Machine Learning and Applications		1 credit	3	CT
Course 4	9007740	Capstone Project with Industry Partners		1 credit	3	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

Foundations of Programming for Data Science and Artificial Intelligence

01.0 Explain and use design thinking to solve a problem.
02.0 Develop an awareness of microcomputers and how they work.
03.0 Know the basic structure of a CPU (Central Processing Unit) and GPU (Graphics Processing Unit).
04.0 Explain what an ALU (Arithmetic Logic Unit) is and how it works.
05.0 Demonstrate understanding about various aspects of digital memory.
06.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies related to AI and Data Science.
07.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in data science.
08.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
09.0 Distinguish between iterative and non-iterative program control structures.
10.0 Describe the processes, methods, and conventions for software development and maintenance for data science.
11.0 Explain the types, uses, and limitations of testing for ensuring quality control.
12.0 Create a program design document to support engineering design of a program or product.
13.0 Create programs that solve a problem using non-iterative and iterative algorithms.
14.0 Design a computer program to meet specific physical, operational, and interaction criteria for data science.
15.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
16.0 Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages.
17.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input or data sets.
18.0 Be able to read and write data (file I/O) to and from a program.
19.0 Solve problems using critical thinking skills, engineering design, creativity and innovation.
20.0 Describe the importance of ethical and fair use, security and privacy information sharing, ownership, licensure and copyright of created programs and data.

OR

Intermediate Programming

21.0 Design a computer program to meet specific physical, operational and interaction criteria.
22.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
23.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.
24.0 Effectively communicate and collaborate.
25.0 Demonstrate responsible use of technology and information.
26.0 Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages.

Data Analytics and Database Design

27.0 Generate and tell stories with data.
28.0 Think critically about data.
29.0 Collect, analyze, and visualize a dataset to gain insight.
30.0 Know and apply best practices in data visualization.
31.0 Construct interactive dashboards following best practices.
32.0 Understand and apply concepts in probability.
33.0 Understand and apply concepts in basic statistics.
34.0 Understand and apply concepts in statistical sampling.
35.0 Understand and apply concepts in hypothesis testing.
36.0 Be aware of the limitations of statistics and cognitive biases in data analysis.
37.0 Understand how data is accessed, sorted, and stored.
38.0 Become more SQL literate.
39.0 Understand design considerations and apply best practices in designing SQL databases.
40.0 Identify data privacy/ data governance issues and methods to mitigate them.
41.0 Understand common cybersecurity issues and mitigation methods.

Machine Learning and Applications

42.0 Identify and define intelligent behavior.
43.0 Articulate the relationship between AI, Machine Learning, and Computer Science.
44.0 Identify and describe the types of representations and algorithms designed into AI-enabled technologies.
45.0 Define and investigate examples of AI applications.
46.0 Explain how domain knowledge is used in the design of AI systems.
47.0 Describe machine learning algorithms in AI-enabled technologies.
48.0 Explain the key technical challenges in design and responsible use of AI technologies.
49.0 Describe different types of data and how they are used in AI.
50.0 Explain and use design thinking to solve a problem.
51.0 Apply the machine learning life cycle in the development and use of a machine learning model.
52.0 Recognize and identify mathematical principles upon which machine learning and AI are built such as calculus, linear algebra, probability, statistics, and optimization partial derivatives.
53.0 Train and evaluate a range of ML models based on specific accuracy, inclusivity, and ethical design criteria.
54.0 Use and evaluate supervised learning techniques to classify or predict outputs.
55.0 Use and evaluate unsupervised learning techniques to solve problems.
56.0 Understand neural networks and their components.
57.0 Use and evaluate different types of neural network architectures and their applications.
58.0 Use and evaluate reinforcement learning techniques to solve problems.
59.0 Research and explain the advancements in computing hardware that make AI possible.
60.0 Understand and articulate how AI can impact society in both positive and negative ways.
61.0 Understand the best practices and key characteristics of bias, fairness, transparency, explainability, accountability of ethically designed AI systems and decision-making practices.

62.0 Identify different kinds of data, their sources, and how they might be used in decision making.
63.0 Critique data and data-based claims to avoid being misled by data through identifying bias, confounding, and random error.
64.0 Describe the limitations of machine learning and the decisions that can be made with data.
65.0 Explore the characteristics, tasks, work attributes, options, and tools associated with AI-enabled careers.
66.0 Identify how leadership development, school and community service projects and competitive events are integral parts of career and technology education.

Capstone Project with Industry Partners

67.0 Explain and use design thinking to solve a problem.
68.0 Design AI solutions using embedded computing (as applicable to specific projects).
69.0 Explore the characteristics, tasks, work attributes, options, and tools associated with AI-enabled careers and educational pathways to achieve these career goals.
70.0 Use appropriate tools to design an AI System to solve problems.
71.0 Set up and use a machine learning (ML) pipeline to solve a problem.
72.0 Appropriately use automated services to accomplish common tasks.
73.0 Use data analysis and visualization tools to work with datasets and gain insights.
74.0 Apply the machine learning life cycle in the development and use of a machine learning model.
75.0 Design and develop AI systems to solve a problem or design solutions for social and ethical issues.
76.0 Create a portfolio of AI projects that demonstrate ability to program machine learning models using a wide range of AI algorithms.
77.0 Research and evaluate various AI careers involved in AI system usage, design, development, deployment, and maintenance.

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Programming for Data Science and Artificial Intelligence**
Course Number: **9007710**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with the computer programming skills necessary to perform AI applications. Topics will include the ethical and societal importance of AI, awareness of microcomputers, arithmetic log unit, various aspects of digital memory, computer programming languages and emerging technology in Artificial Intelligence and Data Science. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
01.0	Explain and use design thinking to solve a problem. The student will be able to:
01.01	Distinguish between social and personal problems to be solved through a design.
01.02	Identify a challenge of social importance and personal interest.
01.03	Students develop problem statements embedded within a complex challenge.
01.04	Understanding challenges and user needs more deeply.
01.05	Pattern and sort user data to define design challenges.
01.06	Use a formal brainstorming process to generate ideas.
01.07	Test and iterate prototypes.
01.08	Refine prototypes based on user feedback.
01.09	Create stakeholder maps.
02.0	Develop an awareness of microcomputers and how they work. The student will be able to:
02.01	Explain the general architecture of a microcomputer system.
02.02	Explain the need for and use of peripherals (e.g., keyboards, sensory input, geospatial input).
02.03	Demonstrate proficiency using peripherals.
02.04	Differentiate between diagnosing and troubleshooting peripherals.
02.05	Describe the necessary components for data storage and memory, and how it affects programming (e.g., RAM, ROM).

CTE Standards and Benchmarks	
	02.06 Differentiate between multiple levels of hardware and software (e.g., CPU hardware, operating system, translation, interpretation) that support program execution.
	02.07 Evaluate various forms of input and output (e.g., IO, storage devices, digital media).
03.0	Know the basic structure of a CPU (Central Processing Unit) and GPU (Graphics Processing Unit). The students will be able to:
	03.01 Know the basic functions a CPU performs.
	03.02 Identify the main components within a CPU and describe their functionality - Memory or Storage Unit, Control Unit, and ALU (Arithmetic Logic Unit).
	03.03 Know the basic functions a GPU performs.
	03.04 Compare and contrast how CPU and GPU are structured differently and have different applications among Data Science use cases.
04.0	Explain what an ALU (arithmetic logic unit) is and how it works. The students will be able to:
	04.01 Understand that an ALU is responsible for performing arithmetic and logical functions or operations.
	04.02 Provide examples of the logical operations that an ALU performs (e.g., AND, OR, XOR, etc.).
	04.03 Provide examples of the arithmetic functions that an ALU performs (e.g., add, subtract, negation, etc.).
	04.04 Provide examples of the bit-wise operations that an ALU performs (e.g., left, right, rotation, and their purposes).
05.0	Demonstrate understanding about various aspects of digital memory. The students will be able to
	05.01 Know that computer registers are memory units inside a CPU designed to be small and fast for frequently accessed data.
	05.02 Give examples of different types of registers and describe their specific functions (e.g., instruction, program counter, memory address, memory buffer, etc.).
	05.03 Know that an address is a reference to a specific memory location that software or hardware can understand.
	05.04 Describe different address types, units of address resolution, and address schemes.
	05.05 Compare and contrast stack vs. heap memory allocation schemes - describe them and list their respective benefits and drawbacks.
06.0	Develop awareness of common computer programming languages, software applications, career tracks, and emerging technology in Data Science and AI. The student will be able to:
	06.01 Identify the main programming languages used for Data Science – compare and contrast their benefits and barriers to use.
	06.02 Understand the difference between software applications for Data Science vs. traditional program automation. Distinguish between local machine, web-based, network-based, or supercomputer-based applications.
	06.03 Understand the applications of Data Science to provide information and solve problems across multiple industries, including locally based ones.
	06.04 Explore careers in Data Science and AI, including those that require postsecondary education.
	06.05 Identify emerging technologies that can implement and apply Data Science, as well as display and inform potential stakeholders about use cases.

CTE Standards and Benchmarks	
07.0	Explore the characteristics, tasks, work attributes, options, and tools associated with a career in Data Science. The student will be able to:
07.01	Explore a variety of careers to which computing is central.
07.02	Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, and cloud computing).
07.03	Discuss the applications of Data Science within various industry sectors.
07.04	Identify design tasks performed by programmers (e.g. problem definition, requirements gathering, stakeholder alignment).
07.05	Describe how businesses use computer programming to solve business problems.
07.06	Investigate job opportunities in the programming field.
07.07	Explain different specializations and relevant training in the computer programming field.
07.08	Explain the need for continuing education and training of computer programmers.
07.09	Explain software as a service (SaaS) and how it impacts business.
07.10	Describe ethical responsibilities of computer programmers (e.g., impacts of irresponsible use of information) (e.g., plagiarism and falsification of data) on collaborative projects.
07.11	Identify credentials and certifications that may improve employability for a computer programmer.
07.12	Identify devices, tools, and other environments for which programmers may develop software.
08.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to
08.01	Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
08.02	Explain the types and uses of variables in programs.
08.03	Determine the best data type to use for given programming problems.
08.04	Compare and contrast simple data structures and their uses.
08.05	Identify the types of operations that can be performed on different data types (e.g., math operations on numerical data types, concatenation, and other string operations).
08.06	Evaluate arithmetic and logical expressions using appropriate operator precedence.
08.07	Explain how computers store different data types in memory.
08.08	Demonstrate the difference between "data" and "information".
08.09	Use different number systems to represent data.
08.10	Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
08.11	Use Boolean logic to perform logical operations using Boolean algebra and truth tables.

CTE Standards and Benchmarks	
09.0	Distinguish between iterative and non-iterative program control structures. The student will be able to
09.01	Identify the uses of non-iterative and iterative programming structures using pseudocode and flowcharts.
09.02	Create iterative programming structures and their uses.
09.03	Explain how sequence, selection, and iteration are building blocks of algorithms.
10.0	Describe the processes, methods, and conventions for software development and maintenance for data science. The student will be able to:
10.01	Describe a software development process that is used to solve problems at different software development stages.
10.02	Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).
10.03	List and explain the steps in the program development cycle.
10.04	Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
10.05	Describe different methods used to facilitate version control.
11.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
11.01	Explain the uses and limits of testing in ensuring program quality.
11.02	Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
11.03	Describe and identify types of programming errors.
12.0	Create a program design document to support engineering design of a program or product The student will be able to:
12.01	Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
12.02	Describe and use tools for developing a program design (e.g., flowcharts, design documents, pseudocode).
12.03	Explain the role of existing libraries and packages in facilitating programmer productivity.
12.04	Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML, flowcharts, design documents, pseudocode).
12.05	Develop a software artifact (independently and collaboratively) in phases (or stages) according to a common software development methodology (e.g., Waterfall or Spiral model).
12.06	Define input and output for a program module using standard design methodology.
13.0	Create programs that solve a problem using non-iterative and iterative algorithms. The student will be able to:
13.01	Apply the developmental cycle methodologies to create a program.
13.02	Develop a program using string and/or numeric data types.

CTE Standards and Benchmarks	
	13.03 Develop a program using sequential algorithms.
	13.04 Develop a program using selection structures.
	13.05 Develop a program using looping structures.
14.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:
	14.01 Choose appropriate data types depending on the needs of the program.
	14.02 Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
	14.03 Design and develop program for efficiency (e.g., less memory usage, fewer I/O parameters, faster processing).
	14.04 Compare techniques for analyzing massive data collections.
	14.05 Identify the software environment required for a program to run (e.g., operating system required, delivery method such as mobile/ web-based/ desktop).
	14.06 Create mobile computing applications and/or dynamic webpages by using a variety of design and development tools, programming languages and mobile devices/ emulators.
	14.07 Explain the role of an application programming interface (API), and distinguish between a programming language's syntax and the API.
	14.08 Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
15.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
	15.01 Use appropriate naming conventions to define program variables and methods.
	15.02 Use a program editor to write the source code for a program.
	15.03 Write programs that use selection structures.
	15.04 Write programs that use repetition structures.
	15.05 Write programs that use nested structures.
	15.06 Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable, and function/module names) to document a program according to accepted standards.
	15.07 Compile, run, test and debug programs.
	15.08 Write programs that use standard arithmetic operators with different numerical data types.
	15.09 Write programs that use standard logic operators.
	15.10 Write programs that use a variety of common data types.
	15.11 Write programs that perform data conversion between numeric and string data types.

CTE Standards and Benchmarks	
	15.12 Write programs that define, use, search, and sort arrays.
16.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
	16.01 Differentiate between multiple levels of operating system, translation, and interpretation that support program execution.
	16.02 Explain the program execution process (by an interpreter and in CPU hardware).
	16.03 Describe object-oriented concepts.
	16.04 Explain the characteristics of procedural and object-oriented programming languages.
	16.05 Compare and contrast programming languages that are compiled, interpreted, and translated.
17.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	17.01 Determine the results of code segments.
	17.02 Write programs that perform user input and output.
	17.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	17.04 Write program modules such as functions, subroutines, or methods.
	17.05 Write program modules that accept arguments.
	17.06 Write program modules that return values.
	17.07 Write program modules that validate arguments and return error codes.
	17.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	17.09 Use APIs and libraries to facilitate programming solutions.
	17.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
	17.11 Explain how abstraction manages complexity.
18.0	Be able to read and write data (file I/O) to and from a program. The student will be able to
	18.01 Be able to read in data from a file as text or binary.
	18.02 Be able to write data to a file as text or binary.
	18.03 Stream data to a text or binary file.
	18.04 Recognize and mitigate potential file handles and text encoding issues.
19.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to
	19.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.

CTE Standards and Benchmarks		
	19.02	Employ critical thinking and collaborative skills to resolve conflicts.
	19.03	Identify and document workplace performance goals and monitor progress toward those goals.
	19.04	Conduct technical research to gather information necessary for decision-making.
	19.05	Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
20.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:	
	20.01	Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	20.02	Discuss the impact of government regulation on privacy and security.
	20.03	Describe how different types of software licenses (e.g., open source and proprietary licenses) can be used to share and protect intellectual property.
	20.04	Explain how access to information may not include the right to distribute the information.
	20.05	Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software.
	20.06	Discuss security and privacy issues that relate to computer networks.
	20.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
	20.08	Understand, describe and implement FAIR data practices.

Florida Department of Education
Student Performance Standards

Course Title: **Intermediate Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
21.0	Design a computer program to meet specific physical, operational and interaction criteria. The student will be able to:
21.01	Choose appropriate data types depending on the needs of the program.
21.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
21.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
21.04	Compare techniques for analyzing massive data collections.
21.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
21.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
21.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
21.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
22.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
22.01	Use appropriate naming conventions to define program variables and methods.
22.02	Use a program editor to write the source code for a program.
22.03	Write programs that use selection structures.
22.04	Write programs that use repetition structures.
22.05	Write programs that use nested structures.
22.06	Use internal documentation (*e.g.*, single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.

CTE Standards and Benchmarks	
	22.07 Compile, run, test and debug programs.
	22.08 Write programs that use standard arithmetic operators with different numerical data types.
	22.09 Write programs that use standard logic operators.
	22.10 Write programs that use a variety of common data types.
	22.11 Write programs that perform data conversion between standard data types.
	22.12 Write programs that define, use, search, and sort arrays.
	22.13 Write programs that use user-defined data types.
	22.14 Demonstrate understanding and use of appropriate variable scope.
	22.15 Use global and local scope appropriately in program implementation.
	22.16 Distinguish between binary and sequential searches.
23.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	23.01 Determine the results of code segments.
	23.02 Write programs that perform user input and output.
	23.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	23.04 Write program modules such as functions, subroutines, or methods.
	23.05 Write program modules that accept arguments.
	23.06 Write program modules that return values.
	23.07 Write program modules that validate arguments and return error codes.
	23.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	23.09 Use APIs and libraries to facilitate programming solutions.
	23.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
	23.11 Explain how abstraction manages complexity.
24.0	Effectively communicate and collaborate. The student will be able to:
	24.01 Evaluate modes of communication and collaboration.
	24.02 Select appropriate tools within a project environment to communicate with project team members.
	24.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a

CTE Standards and Benchmarks	
	collaborative software project.
24.04	Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
24.05	Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
24.06	Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
25.0	Demonstrate responsible use of technology and information. The student will be able to:
25.01	Implement an encryption, digital signature, or authentication method.
25.02	Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
25.03	Identify and explain the existence of biases in computer programming.
25.04	Explain how computing can play a role in social and political issues.
26.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
26.01	Differentiate between multiple levels of operating system, translation, and interpretation that support program execution.
26.02	Explain the program execution process (by an interpreter and in CPU hardware).
26.03	Describe object-oriented concepts.
26.04	Explain the characteristics of procedural and object-oriented programming languages
26.05	Compare and contrast programming languages that are compiled, interpreted, and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Data Analytics and Database Design**
Course Number: **9007720**
Course Credit: **1**

Course Description:

The purpose of this course is to instruct students in the best practices for data visualization, dashboard design, and any relevant considerations thereof, such as data pre-processing, visual aesthetics, accurate and effective data representation. The content includes but is not limited to foundational knowledge and skills related to software methods and interactive plotting libraries. Moreover, the course covers foundational concepts in statistics, SQL querying, relational database design, as well as how to address concerns in data privacy and security. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
27.0	Generate and tell stories with data. The student will be able to:
27.01	Collect, organize, proofread, and arrange data into charts and graphs.
27.02	Identify structural components of data representations (e.g., axes on a graph, table rows and columns, scale on a geographic map, key on a color map, etc.).
27.03	Organize data and tell the data story presented in simple charts and graphs.
27.04	Interpret and explain more complex charts that record more variables.
27.05	Decode data: Identify and extract measurements, values or data points and what they represent from graphs, tables, or other data representations.
28.0	Think critically about data. The student will be able to:
28.01	Understand and explain how data changes over time (e.g., weather through seasons).
28.02	Analyze information and derive conclusions based on the data presented.
28.03	Show ability to interpret and make predictions based on data that changes over time.
28.04	Interpret data representations accurately and describe meaningful patterns within the data.
28.05	Identify potential bias and missing data; accurately connect position statements with datasets that support them.
28.06	Separate factual information from inferences.
28.07	Make quantitative and qualitative comparisons of data.
28.08	Use appropriate mathematical/ statistical methods to develop and/or support claims that address specific scientific questions.

CTE Standards and Benchmarks	
29.0	Collect, analyze, and visualize a dataset to gain insight. The student will be able to:
29.01	Identify different kinds of data and how they might be used in decision making.
29.02	Describe and construct a simple model of the data processing cycle (input-processing-output).
29.03	Collect, organize, and manipulate different types of data with a data analysis and manipulation tool (e.g., Pandas).
29.04	Describe the information various online datasets provide and identify the types of questions they can and cannot answer.
29.05	Use good practices for statistical sampling and testing, such as incorporation of uncertainties in estimation using margins of error or interval estimates to accurately analyze data.
29.06	Apply statistics to find patterns in data.
29.07	Use spreadsheet and Python functions to create tables and graphs to visually represent and communicate findings.
29.08	Construct informed summaries, decisions, and predictions related to the data.
29.09	Tell a data story using appropriate visualizations that are clear, compelling and accessible for the audience (e.g., infographics, charts, graphs, interactive dashboards, etc.).
30.0	Know and apply best practices in data visualization. The student will be able to:
30.01	Realize that the human brain combines visual cues and form immediate conclusions.
30.02	Give examples of "simple" vs. "complex" charts and identify situations where they work best.
30.03	Consider the audience and goals of the data visuals and make appropriate design decisions.
30.04	Decide whether or how to shape the data before constructing the graphs.
30.05	Determine which chart types to use and make appropriate design decisions.
30.06	Apply and shape visual elements to convey desired messages (e.g., color, size, placement, etc.).
30.07	Make sure that chart elements e.g. axes, labels, titles, are accurate and don't mislead the readers.
30.08	Define "chart junk" and know how to minimize it.
30.09	Realize that stories and narratives often make data conclusions more compelling.
30.10	Construct a logical presentation flow in presenting findings from data analysis.
30.11	Apply appropriate design choices for presentation slides and other elements.
30.12	Present data in a manner that is appropriate and compelling for the audience.
30.13	Experiment with visualizing complex concepts (e.g., confidence intervals.)
30.14	Experiment with visualizing complex multidimensional data.
31.0	Construct interactive dashboards following best practices. The student will be able to:

CTE Standards and Benchmarks	
	31.01 Understand the strengths and inherent limitations of dashboards.
	31.02 Write Python code and import libraries for user interactivity.
	31.03 Perform any data cleaning and processing before plotting data.
	31.04 Conceptualize dashboard layouts and go through design iterations.
	31.05 Decide on appropriate chart types to include.
	31.06 Apply appropriate "slice and dice" data filters for commonly-asked data questions.
	31.07 Observe and/or anticipate how the user might interact with dashboard elements.
	31.08 Place visual elements that properly convey relationships and hierarchies.
	31.09 Effectively control visual noise in layout and interactivity.
32.0	Understand and apply concepts in probability. The student will be able to:
	32.01 Define a sample space and enumerate the probabilities of possible outcomes.
	32.02 Know what permutations are, give examples, and calculate them.
	32.03 Know what combinations are, give examples, and calculate them.
	32.04 Know what percentiles are, give examples, and calculate them.
	32.05 Understand conditional probabilities as contingent multiple events.
	32.06 Calculate probabilities for multiple events by constructing probability trees.
	32.07 Understand dependent vs. independent events and give examples.
	32.08 Know what Bayes Theorem is and apply to scenarios with conditional probabilities.
	32.09 Understand discrete vs. continuous probabilities and give examples.
	32.10 Calculate binomial probabilities and plot distributions thereof.
33.0	Understand and apply concepts in basic statistics. The student will be able to:
	33.01 Calculate means, medians, modes, and explain scenarios where each is best used.
	33.02 Calculate ranges, variances, and explain what they imply about the data.
	33.03 Describe normal distributions and give examples.
	33.04 Calculate Z-scores and explain their meaning.
	33.05 Understand what the empirical rule is and apply to exploratory data analysis.

CTE Standards and Benchmarks	
	33.06 Identify examples of skewed distributions and understand their ramifications.
	33.07 Locate any outliers in the data and understand their effect on summary statistics.
34.0	Understand and apply concepts in statistical sampling. The student will be able to:
	34.01 Define what sampling means and give examples.
	34.02 Understand the importance of sample size.
	34.03 Know what the Central Limit Theorem is and its implications.
	34.04 Calculate the standard error for sample proportions and explain its implications.
	34.05 Calculate the standard error for sample means and explain its implications.
	34.06 Define what a confidence interval is and give examples.
	34.07 Understand the limitation of confidence intervals in making conclusions about data.
35.0	Understand and apply concepts in hypothesis testing. The student will be able to:
	35.01 Define what hypothesis testing is.
	35.02 Identify situations where hypothesis testing is appropriate.
	35.03 Define the null hypothesis and give examples.
	35.04 Define the alternative hypothesis and give examples.
	35.05 Know the difference between one-tailed vs. two-tailed tests and give examples.
	35.06 Set up a significance test for proportions and draw appropriate conclusions.
	35.07 Set up a significance test for means and draw appropriate conclusions.
	35.08 Understand the difference between Type I and II errors and their implications.
36.0	Be aware of cognitive biases and the limitations of statistics in data analysis. The student will be able to:
	36.01 Identify and understand what the Anscomb's Quartet says about summary stats.
	36.02 Recognize and understand how sampling bias can occur.
	36.03 Define and give examples of cognitive biases (e.g., survivorship bias, confirmation bias, anchoring, availability, endowment effect, etc.).
37.0	Understand how data is accessed, sorted, and stored. The student will be able to:
	37.01 Explain the role that computers play in storing and accessing data.
	37.02 Explain how computing devices represent and manipulate information.

CTE Standards and Benchmarks	
	37.03 Identify and understand the roles of databases in everyday life.
	37.04 Describe databases and how they organize and transform data.
	37.05 Understand datasets with multiple categories/ arranged in scaled graphs.
	37.06 Collect, organize, manipulate, and transform data.
	37.07 Understand and show ability to represent and manipulate data/ databases.
	37.08 Create, modify, and manipulate databases.
38.0	Become more SQL literate. The student will be able to
	38.01 Understand what a relational database is and when they are used.
	38.02 Know what SQL is and when it is used.
	38.03 Recognize there are different versions of SQL, their commonalities and differences.
	38.04 Retrieve data with SELECT statements.
	38.05 Filter query results with WHERE clauses.
	38.06 Apply comparators (e.g., LIKE, IN, and wildcards with WHERE).
	38.07 Sort query results with ORDER BY.
	38.08 Use string functions on the data.
	38.09 Change report headings with aliases.
	38.10 Use date functions with WHERE.
	38.11 Use GROUP BY with count.
	38.12 Filter grouped results with HAVING.
	38.13 De-duplicate with SELECT DISTINCT.
	38.14 Merge rows with GROUP BY.
	38.15 Understand how SQL indices and keys are used.
	38.16 Understand different types of SQL JOIN.
	38.17 Merge data across tables with JOIN.
	38.18 Combine rows with SQL UNION.
	38.19 Merge data across tables with IN.

CTE Standards and Benchmarks	
	38.20 Select from a selection with subqueries.
	38.21 Write more efficient queries.
39.0	Understand design considerations and apply best practices in designing SQL databases. The student will be able to:
	39.01 Know what the ACID principles for transactions are.
	39.02 Model and plan the structure of a database.
	39.03 List and name data tables that go into a database.
	39.04 Determine what data columns and data types each table contains.
	39.05 Designate a primary key for each data table.
	39.06 Identify any useful foreign keys among tables.
	39.07 Characterize the relationships among tables (e.g., one-to-one, one-to-many, etc.).
	39.08 Maintain referential integrity among tables.
	39.09 Describe normalization and when/why it is helpful.
	39.10 Define the first normal form and when it is applied.
	39.11 Define the second normal form and when it is applied.
	39.12 Define the third normal form and when it is applied.
	39.13 Describe denormalization and when/when it is helpful.
	39.14 Recognize issues with access control, compliance, and SQL injection.
40.0	Identify data privacy/ data governance issues and methods to mitigate them. The student will be able to:
	40.01 Understand that identity protection is critical.
	40.02 Name examples of personally identifiable information (PII).
	40.03 Name examples of data that is not PII.
	40.04 Cite examples of existing privacy laws and understand their scope.
	40.05 Realize the combination of data points that alone would not uniquely identify someone can be used to precisely identify a person when used together.
	40.06 Understand the various parts of a data processing ecosystem (e.g., databases, controllers, IT, governing bodies, etc.).
	40.07 Recognize issues in data processing (e.g., database misconfigurations, lax security settings, inaccurate data, improper or excessive collection of information, demographical biases, etc.).
	40.08 Perform a risk assessment by identifying risks in data processing and ways to mitigate them.

CTE Standards and Benchmarks	
	40.09 Understand the implications of a set of data privacy policies.
	40.10 Define and understand the phases of the data life cycle (e.g., obtaining consent, collecting/ retaining/ processing data, disclosing/ transferring data, and archiving or destroying data).
	40.11 Describe what data inventory is and why it is important.
	40.12 Know the main steps in a data inventory process.
41.0	Understand common cybersecurity issues and mitigation methods. The student will be able to:
	41.01 Identify and describe common types of cyber-attacks (e.g., malwares, phishing, denial of service, SQL injection, etc.).
	41.02 Know ways to mitigate common types of cyber-attacks.
	41.03 Know how common data breaches are and describe ways to safeguard PII data from such breaches.

Florida Department of Education
Student Performance Standards

Course Title: **Machine Learning and Applications**
Course Number: **9007730**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with core foundational knowledge to deepen understanding of machine learning (ML) practices and applications. This course builds understanding of the mathematical foundation needed to create algorithms for use in artificial intelligence and machine learning. The content includes but is not limited to foundational knowledge and skills related to computer coding and software development. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
42.0	Identify and define intelligent behavior. The student will be able to:
42.01	Explain that "knowing" something means the ability to both represent and reason with it.
42.02	Explain the difference between knowledge and “knowing” (e.g., books can represent knowledge, but they do not "know" things because they cannot make use of that knowledge.)
42.03	Know and state conditions where behavior is intelligent using non-trivial sense-deliberate-act cycle.
42.04	Identify examples of intelligent and non-intelligent machine/agent behavior.
42.05	Explain common sense reasoning, emotional intelligence, deductive, and inductive reasoning and characteristics of quintessential human intelligence.
42.06	Describe the limitations of AI for natural interaction.
42.07	Identify the types of problems that are difficult for AI to solve (e.g., AI General Intelligence/ Strong AI, natural language understanding, computer vision)
42.08	Identify, explain, and debate the issues of AI and consciousness.
43.0	Articulate the relationship between AI, Machine Learning, and Computer Science. The student will be able to:
43.01	Describe computer science as a discipline focused on the study of computers and algorithmic processes, including their principles, their hardware and software designs, their implementation, and their impact on society.
43.02	Describe AI as a branch of computer science that studies the science and engineering of making intelligent machines, especially intelligent computer programs that enable them to make predictions, decisions, plans, and solve problems.
43.03	Describe machine learning as a set of techniques that that enables a computer system to learn from data rather than through explicit programming. Machine learning techniques can be used to build models that make solve problems, make predictions, and make decisions.

CTE Standards and Benchmarks	
	43.04 Describe the differences between the field of AI and ML.
44.0	Identify and describe the types of representations and algorithms designed into AI-enabled technologies. The student will be able to:
	44.01 Identify examples of abstractions used in everyday life, describe the characteristics of abstractions, and explain how they are different than their real-world counterparts.
	44.02 Describe the two major types of knowledge representations (i.e., symbolic and numerical representations), identify examples of each type, and explain when each is used in AI solutions.
	44.03 Identify and describe classification, inference, approximation, optimization, recognition, and search families of reasoning algorithms and how they can solve problems.
	44.04 Explain how and when data structures (e.g., trees, graphs, arrays, schemas) are used to represent data in AI (e.g., search trees, decision trees, maps, 1D Arrays -feature vectors. 2D-Arrays – tables, matrices).
	44.05 Construct a representation of data, game, map, or real-world object/scenario/problem using a data structure (e.g., graph – map or game board, tree – classification and moves in a game, array – feature vector, schema – description of a concept), identify the parts of the representation and explain how to reason with them.
	44.06 Evaluate and use the appropriate data structure for programming a specific machine learning algorithm.
	44.07 Research the different kinds of symbolic representations used to encode information about the world (e.g., symbols, relationships, properties, etc.) in ways a computer can reason with to solve complex tasks (i.e. diagnosing a medical condition or having a dialog in a natural language).
45.0	Define and investigate examples of AI applications. The student will be able to:
	45.01 Identify and describe AI technologies students interact with frequently and determine what issues the AI is intended to address.
	45.02 Discuss how AI is and could be used to enhance areas of student interest, real-world problems, business needs, and the future of work.
	45.03 Understand the ways natural language processing can be used to create software to solve a wide range of problems related to written and spoken language.
	45.04 Construct a chatbot and describe the factors that constrain the range of responses.
	45.05 Name common computer vision tasks (e.g., image classification, object detection, semantic segmentation, image analysis, face detection, analysis, and recognition; optical character recognition (OCR)) and how they might be used to solve problems.
	45.06 Experiment with software that recognizes emotions in facial expressions.
46.0	Explain how domain knowledge is used in the design of AI systems. The student will be able to:
	46.01 Understand and describe how AI systems rely on domain knowledge from many fields including visual perception, linguistics, human behavior, psychology, anatomy and physiology, philosophy, and mathematics.
	46.02 Explain how domain knowledge in AI systems can be provided by human experts or derived from statistics collected from millions of sentences, images, expert-labeled data, etc.
	46.03 Explain and demonstrate how natural language understanding including speech recognition, speech generation, and speech translation is applied in speech recognition systems.

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46.04	Explain and demonstrate how human language can be ambiguous and strategies AI uses to resolve ambiguity.
46.05	Explain and demonstrate how domain knowledge is used to classify, compare, or generate music.
46.06	Explain and demonstrate how domain knowledge is used to play board games and solve puzzles.
46.07	Explain and demonstrate how domain knowledge is used to recognize faces, gestures, and scenes.
46.08	Explain and demonstrate how domain knowledge is used to recognize affect from images (e.g., gestures, facial expressions).
46.09	Explain and demonstrate how domain knowledge is used to recognize sentiment from text or speech.
46.10	Identify and demonstrate the use of domain knowledge in the creation and use of medical diagnosis, finance, or manufacturing systems, building and construction, education, criminal justice, etc.
46.11	Understand that domain knowledge and best practices can be one-way – human bias can affect the decisions AI systems make, either in the collection and selection of examples to train systems or the interpretation of results of an AI system.
46.12	Describe the types of tasks where AI outperforms humans and those where humans outperform AI.
47.0	Describe machine learning algorithms in AI-enabled technologies. The student will be able to
47.01	Define machine learning as a set of techniques (algorithms) that allow a computer to learn behaviors without explicit programming.
47.02	Explain that machine learning algorithms are learning "patterns" in data to construct internal representations that encode the relationship between inputs and outputs, which results in a model for reasoning.
47.03	Explain the difference between machine learning and human learning.
47.04	Identify supervised, unsupervised, reinforcement, and transfer learning types of machine learning, and provide examples of the types of problems they solve.
47.05	Illustrate and compare how supervised, unsupervised, and reinforcement learning algorithms adjust internal representations to learn for classification or prediction.
47.06	Identify CNN, RNN, GAN types of neural networks in image classification, speech recognition, and other applications.
47.07	Select the appropriate type of machine learning algorithm (supervised, unsupervised, or reinforcement learning) to solve a reasoning problem and explain why this algorithm is most appropriate for this type of problem.
48.0	Explain the key technical challenges in design and responsible use of AI technologies. The student will be able to:
48.01	Explain and demonstrate how training data influences learning.
48.02	Explain how developing an AI application involves humans making numerous technical and ethical decisions.
48.03	Explain the current issues with explainability of decisions made with neural networks and other deep learning architectures
48.04	Explore the challenges of using explainable AI (e.g., cost, ability to develop solutions when issues are discovered).
49.0	Describe different types of data and how they are used in AI. The student will be able to:
49.01	Identify the different kinds of data we collect and share as Internet users.

CTE Standards and Benchmarks	
	49.02 Define numeric, text, date, graphics and sound types of data that computers use.
	49.03 Distinguish that data requires context to be information.
	49.04 Describe how computers store data using bits (binary digits).
	49.05 Describe and construct a simple model of the data processing cycle (input-processing-output).
	49.06 Describe how AI uses data to make predictions.
50.0	Explain and use design thinking to solve a problem. The student will be able to:
	50.01 Distinguish between social and personal problems to be solved through a design.
	50.02 Identify a challenge of social importance and personal interest.
	50.03 Students develop problem statements embedded within a complex challenge.
	50.04 Understanding challenges and user needs more deeply.
	50.05 Pattern and sort user data to define design challenges.
	50.06 Use a formal brainstorming process to generate ideas.
	50.07 Test and iterate prototypes.
	50.08 Refine prototypes based on user feedback.
	50.09 Create stakeholder maps.
	50.10 Develop point-of-view statements for users.
	50.11 Develop a blueprint for a prototype.
	50.12 Gather feedback from users.
	50.13 Revise prototypes and present rationale for final design.
51.0	Apply the machine learning life cycle in the development and use of a machine learning model. The student will be able to:
	51.01 Identify and evaluate a problem appropriate for solving by machine learning.
	51.02 Describe the data pipeline steps, including data collection, manipulation, cleansing, and transformation.
	51.03 Understand how to make sure each step in the data pipeline is carried out ethically and responsibly.
	51.04 Identify biases and ethical factors to consider when evaluating sources of data.
	51.05 Locate data from reliable sources.
	51.06 Find, convert, clean, and label the data features.

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	51.07 Evaluate, select, and test an appropriate model.
	51.08 Select and justify the appropriateness of the learning algorithm for the particular problem and data.
	51.09 For classification problems, define and distinguish between balanced and imbalanced datasets, and identify potential issues with imbalanced datasets.
	51.10 Define and explain the differences among training, validation, and test datasets.
	51.11 Explain and demonstrate the ways training data influences learning and decisions made by the model.
	51.12 Experiment by adjusting hyper-parameters to tune the model.
	51.13 Use a cross-validation set to determine when training should stop to avoid overfitting.
	51.14 Use a test set to measure performance of the machine learning model.
	51.15 Select appropriate metrics to evaluate success of the model: setting criteria, what to do when it fails in lab; fails in field. This can be done by an independent group for high-stakes applications.
	51.16 Use appropriate tools to deploy and use the machine learning model.
	51.17 Monitor model use over a span to time to evaluate its effectiveness on unseen data and make improvements.
52.0	Recognize and identify mathematical principles upon which machine learning and AI are built such as calculus, linear algebra, probability, statistics, and optimization partial derivatives. The student will be able to:
	52.01 Explain how machine learning uses statistics to find patterns in data to make predictions about future values, identify the relationship between features, and make improvements.
	52.02 Identify the type of mathematical functions machine learning models use (e.g., a simple linear equation, a high-degree polynomial, or a complex nonlinear equation found in deep neural networks).
	52.03 Use a linear regression model and then adjust its parameters to fit a set of data points and use the model to predict a y value for any x value.
	52.04 Model polynomial or logistic regression by using tools to manually adjust the parameters to reach what they perceive as a best fit to the data.
	52.05 Recognize that neural networks are non-convex functions composed of many multi-variable functions.
	52.06 Illustrate and explain the role of gradient-based algorithms for training neural networks and related issues.
	52.07 Evaluate the quality of fit of a machine learning model using the mean squared error to determine if they have been over-fitted or under-fitted and explain the implications for future predictions or classifications made by the model.
	52.08 Utilize visual reporting and statistical tools to perform, understand, and interpret statistics such as regression analysis, hypothesis testing, and sampling distributions.
53.0	Train and evaluate a range of ML models based on specific accuracy, inclusivity, and ethical design criteria. The student will be able to:
	53.01 Apply a supervised or unsupervised learning algorithm on real world data and evaluate the results.
	53.02 Train a classification model and examine model performance on new inputs.

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	53.03 Train a regression model and examine model performance on new inputs.
	53.04 Explain how a goodness of fit measure can be used to quantify the success of model prediction.
	53.05 Evaluate the inclusivity and ethical design of the model.
	53.06 Explore and utilize packages from a data analysis and manipulation tool when training a machine learning model.
	53.07 Utilize visual reporting and statistical tools to perform, understand, and interpret statistics such as regression analysis, hypothesis testing, and sampling distributions.
54.0	Use and evaluate supervised learning techniques to classify or predict outputs. The student will be able to:
	54.01 Research and present real-world problems and applications of supervised learning.
	54.02 Describe how supervised learning algorithms find relationships between feature values and class labels in labeled data to create classification or prediction models.
	54.03 Explain how supervised learning models use features to predict or label new data.
	54.04 Describe how supervised learning algorithms adjust the parameters of a mathematical model (selected in advance by a human) to create models that make correct classifications or predictions.
	54.05 Evaluate the results of a supervised learning model by measuring the percent of items in a test set that are labeled correctly.
	54.06 Describe the types of algorithms that are used for classification (e.g., decision trees, logistic regression, and random forests).
	54.07 Describe the types of algorithms that are used for regression (e.g., linear regression, XGBoost).
	54.08 Evaluate the accuracy/ precision/ recall of a classification model.
	54.09 Describe the benefits and limitations of supervised learning algorithms for solving problems.
55.0	Use and evaluate unsupervised learning techniques to solve problems. The student will be able to:
	55.01 Research and present real-world problems and applications of unsupervised learning (e.g., anomaly detection in fraud and medical images, market basket analysis, recommender systems).
	55.02 Describe how unsupervised learning algorithm finds patterns in unlabeled data by looking for data grouped into clusters.
	55.03 Explain how unsupervised learning differs from supervised learning and how this difference allows unsupervised learning algorithms to solve more complex problems than supervised learning algorithms.
	55.04 Distinguish between data that are appropriate for supervised versus unsupervised learning based on its structure, particularly the presence and roles of inputs and outputs.
	55.05 Use clustering algorithms (e.g., K-means, hierarchical clustering, principal component analysis) to solve a problem.
	55.06 Evaluate the results of an unsupervised learning model by examining the clusters to see if they capture useful distinctions in the dataset (e.g., If the clustering algorithm separates dissimilar observations apart and similar observations together, then it has performed well).
	55.07 Describe the limitations of clustering algorithms (e.g., identification of clusters even if the data does not contain any clusters, unable

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	to understand why elements are clustered together).
56.0	Understand neural networks and their components. The student will be able to:
56.01	Describe and illustrate the fundamental components of a neural network (e.g., input, hidden layers, output) and their purposes.
56.02	Explain the roles hyper-parameters, activation functions, learning rules, and transfer functions play in the development of a machine learning model.
56.03	Illustrate and explain how backpropagation works and how it improves prediction.
56.04	Illustrate and explain how stochastic gradient descent works.
56.05	Research and explain how deep neural networks work.
56.06	Illustrate and explain how feedforward multi-layer work.
56.07	Illustrate and explain how a perceptron work.
57.0	Use and evaluate different types of neural network architectures and their applications. The student will be able to:
57.01	Illustrate the two main components of a Generative Adversarial Network's (GAN) architecture (i.e., generator and discriminator models) and explain how each component works to create realistic images and audio.
57.02	Illustrate the architecture of a convolutional neural network (CNN) and explain the motivation for the model and how it is optimized for computer vision tasks (e.g., image processing, natural language processing, and recommendation systems).
57.03	Illustrate the architecture of a recurrent neural network (RNN) and explain how it is optimized for time-series forecasting (e.g., weather prediction, stock predictions, etc.).
57.04	Describe the purpose of ensemble learning methods and how they are used to improve the performance of machine learning models and identify examples in the real-world.
57.05	Describe the purpose of transfer learning methods and how it is used to decrease the amount of training time for new tasks and identify examples in the real-world.
58.0	Use and evaluate reinforcement learning techniques to solve problems. The student will be able to:
58.01	Research and present real-world problems and applications of reinforcement learning (e.g. self-driving cars, walking, learning a new skill, video games, question answering, machine translation, medical diagnosis, sequential decision making problems).
58.02	Explain that reinforcement learning models focus on how machines can learn to act in a particular way (e.g., robots learning to walk, or chatbots learning to better answer customer problems).
58.03	Describe how reinforcement learning generally works: the learning algorithm uses trial and error to find a policy for choosing actions that maximizes the reinforcement signal.
58.04	Model the ways that reinforcement learners update value predictions or policies (e.g., internal representations).
58.05	Use reinforcement algorithms to solve a problem (e.g., Deep Adversarial Networks, Q-learning).
58.06	Describe the benefits and limitations of reinforcement learning.
59.0	Research and explain the advancements in computing hardware that make AI possible. The student will be able to:

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	59.01 Explain the original purpose of Graphical Processing Units (GPUs) and their role in advancing the field of deep learning.
	59.02 Explain the purpose and function of GPUs in decreasing the training time of machine learning and identify applications that use this approach in the real world.
	59.03 Explain the purpose and function of Tensor Processing Unit (TPU) as an AI accelerator application-specific integrated circuit (ASIC) for neural network machine learning and identify applications that use this approach in the real world.
	59.04 Explain why CPUs are not sufficient for training many machine learning models.
	59.05 Compare and contrast the pros and cons of using GPUs, TPUs, and FPGAs in data processing and performance improvements of AI-based applications.
60.0	Understand and articulate how AI can impact society in both positive and negative ways. The student will be able to:
	60.01 Explain the ways that AI impacts different communities and people in different ways.
	60.02 Research proxies in data for race, ethnicity, socio-economic status, gender, or context that can lead to disparate accuracy and impacts on different people groups.
	60.03 Demonstrate the use of AI is an economic driver that makes new services possible and businesses more efficient.
	60.04 Describe the ways AI technologies are changing business, healthcare, education, government, etc.
	60.05 Explain and provide examples of the ways AI and automation will change the way people work, create new jobs, and eliminate some jobs.
	60.06 Identify, research, and analyze current events in the field of AI, considering new technology developments, social and ethical impact.
	60.07 Identify and describe current challenges and opportunities in AI technologies using non-machine learning aspects of AI such as genetic algorithms, robotics, and computer vision.
	60.08 Make predictions about the future trends or developments in the field of AI based on current AI applications.
	60.09 Research the purpose of organizations that consider how AI can be used for social and ethical good and describe their role in AI development.
	60.10 Identify and describe ethical and societal issues for AI applications in a variety of settings such as public safety, finance, social media marketing, and government, in different cultures and countries.
	60.11 Analyze participation in collective online activities considering the possibilities over problems, opportunities over risks, and community successes over personal gain.
	60.12 Explain the ethical use of technology and digital content with a specific understanding of ownership, licensing, and fair use.
	60.13 Understand consequences of inappropriate technology use.
61.0	Understand the best practices and key characteristics of bias, fairness, transparency, explainability, accountability of ethically designed AI systems and decision-making practices. The student will be able to:
	61.01 Define bias, perception, privacy, and accuracy in the context of AI.
	61.02 Describe and critique how ethics and philosophy explicitly and implicitly play a role in AI applications.

CTE Standards and Benchmarks	
61.03	Explain the key principles of responsible and ethical AI design that result in AI systems that keep fairness, transparency, explainability, human-centeredness, privacy and security interests of users in mind.
61.04	Identify the sources and types of bias in AI systems and models.
61.05	Explain the key approaches to minimizing various types of bias.
61.06	Describe group and individual types of fairness and various views of fairness that affect the metrics for evaluating fairness in systems.
61.07	Describe the relevant algorithms, data, goals, compliance, influence, and usage principles of transparency in AI and explain the regulatory, privacy, and security considerations that are important when making decisions with AI systems.
61.08	Explain the challenges of implementing transparency in AI for companies such as vulnerabilities and security, privacy, intellectual property, legal and risk management.
61.09	Examine the role and importance of taking a human-in-the-loop approach to the training of machine learning models and deployment and use of AI-driven automation of systems.
61.10	Identify the critical points of machine learning model and AI system design (e.g., goals, purposes, and risks) that are not easily identified by automation itself and require human-in-the-loop decision making.
61.11	Provide examples of how explainability vs. interpretability is the most effective means of ensuring AI solutions are transparent, accountable, responsible, fair, and ethical across use cases and industries.
61.12	Provide examples or explain how a company, developer, or decision maker can establish accountability in the development and use of AI to make decisions (e.g., codes of ethics/ responsible design, ethical design considerations, and decision tracking).
61.13	Understand the subjective nature of values across cultures; describe the key principles and challenges of designing AI to align with the norms and values of the user group in mind.
61.14	Describe the expertise and processes needed to ethically design AI to support users (e.g., multi-disciplinary team including ethicists, sociologists, developers, legal/compliance, tracking, etc.).
61.15	Determine whether characteristics of dataset (e.g., incomplete, imbalanced, and/or inappropriately selected) are contributing bias to a machine learning model.
61.16	Evaluate machine learning models for characteristics of measurement bias as a result from faulty measurements (e.g., sensors such as camera color filters, other data collection instruments, and data labeling).
61.17	Explain the need for models to be regularly evaluated and updated to best represent the current world.
62.0	Identify different kinds of data, their sources, and how they might be used in decision making. The student will be able to:
62.01	Explain why data is the fuel of machine learning and the importance of quality data for gaining insights.
62.02	Identify and describe sources of company data such as basic information, economic information, technology information (e.g., website traffic and search trends), and reviews-based information (e.g., business ratings and reviews).
62.03	Identify and describe sources of people data such as Internet behavior: web presence score, social networks and social mentions, search engine results, proxy usage, interests, and purchasing behavior.
62.04	Identify and describe sources of geospatial data such as location-specific alternative data such as demographic information, property information, purchasing behavior, and other business information.

CTE Standards and Benchmarks	
	62.05 Identify and describe sources of time-based data such as real-time information surrounding events, politics, internet trends behavior (e.g., trending keywords and subjects, foot traffic, web traffic), and financial trends (e.g., company share price, GDP, debt history, and unemployment trends).
	62.06 Explain how different kinds of data can be used in decision-making and the form of data (e.g., text, numerical, time series, or image) that may be represented in.
63.0	Critique data and data-based claims to avoid being misled by data through identifying bias, confounding, and random error. The student will be able to
	63.01 Provide examples of the social and personal consequences of predictions derived from models built on data.
	63.02 Distinguish between credible and unreliable information sources.
	63.03 Recognize and describe signs of compromised information or data.
	63.04 Identify and describe errors in decisions and predictions due to faulty use of data.
	63.05 Describe issues of privacy and security with respect to data collection, storage, analysis, and insights.
	63.06 Discuss how and when data can support making decisions.
64.0	Describe the limitations of machine learning and the decisions that can be made with data. The student will be able to:
	64.01 Describe the principle of garbage in/garbage out in relationship to data for training and evaluating the machine learning model, as well as its accuracy and impact.
	64.02 Demonstrate understanding of the inverse relationship between model complexity and transparency and the impact this has on decision-making.
	64.03 Research and evaluate the limitations of machine learning and AI and the impact this has on decision-making.
	64.04 Research the security vulnerabilities of a machine learning model and ways to mitigate them.
	64.05 Research the potential failure modes of AI and evaluate how, when, and why things can go wrong.
	64.06 Research and evaluate the sensitivity of machine learning models to understand how and why it is likely to break.
65.0	Explore the characteristics, tasks, work attributes, options, and tools associated with AI-enabled careers. The student will be able to:
	65.01 Explore a variety of careers that leverage AI tools and systems.
	65.02 Discuss the impact of AI on business and commerce.
	65.03 Evaluate the impacts of irresponsible use of AI technologies.
	65.04 Identify tasks performed by AI-enable professionals.
	65.05 Identify and explain the ways businesses use AI to solve business problems.
	65.06 Investigate AI-enabled career opportunities in various businesses, medicine, engineering, construction, science, social services, government, military, computing, education, manufacturing, finance/banking, etc.

CTE Standards and Benchmarks	
	65.07 Explain different specializations and the related training in AI-enabled careers.
	65.08 Explain the need for continuing education and training of AI-enabled professionals.
	65.09 Explain how AI is used in enterprise software systems and how insights from AI impact decision-making.
	65.10 Describe ethical responsibilities of AI-enabled professionals.
	65.11 Identify credentials and certifications that may improve employability for an AI-enabled professional.
	65.12 Identify devices, datasets, tools, and other environments for which AI-enabled professionals may use, modify, and develop AI systems.
	65.13 Learn that people in various work roles engage in continuous learning to upgrade skills and adapt to change.
66.0	Identify how leadership development, school and community service projects and competitive events are integral parts of career and technology education. The student will be able to:
	66.01 Explain the goals, mission, and objectives of the career-technical student organization (CTSO).
	66.02 Explore opportunities a student organization can leverage to bring business and education together in a positive working relationship through innovative leadership and career development programs.
	66.03 Explore the local, state, and national opportunities available to students through participation in conferences, competitions, community service, philanthropy, and other CTSO activities.
	66.04 Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.
	66.05 Explore competitive events related to the content of this course and the required competencies, skills, and knowledge for each related event for individual, team, and chapter competitions.
	66.06 Understand that learning can occur in both formal and informal environments outside of school.
	66.07 Express a positive attitude towards lifelong learning and how it relates to various careers.

Florida Department of Education
Student Performance Standards

Course Title: **Capstone Project with Industry Partners**
Course Number: **9007740**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with opportunities to apply their knowledge in data analysis, database design, and machine learning to internship projects with collaborating industry partners. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
67.0	Explain and use design thinking to solve a problem. The student will be able to:
67.01	Distinguish between social and personal problems to be solved through a design.
67.02	Develop problem statements embedded within a complex challenge.
67.03	Create stakeholder maps.
67.04	Understand challenges and user needs more deeply.
67.05	Develop point-of-view statements for users.
67.06	Pattern and sort user data to better address design challenges.
67.07	Use a formal brainstorming process to generate ideas.
67.08	Develop a blueprint for a prototype.
67.09	Test and iterate prototypes.
67.10	Gather feedback from users.
67.11	Refine prototypes based on user feedback.
67.12	Revise prototypes and present rationale for final design.
68.0	Design AI solutions using embedded computing (as applicable to specific projects). The student will be able to:
68.01	Identify and define the function of circuits, sensors, microcontrollers, motors, and other components used in embedded systems.
68.02	Assemble an embedded or robotic system that use circuits, sensor(s), microcontroller, microcomputers, motor(s) to complete a specific task.
68.03	Write a program for an embedded or robotic system that makes a decision based on sensor/user input, controls mechanics of the robot, and completes a “human” task (e.g., delivers items, opens a door for someone, solves a puzzle, etc.).

CTE Standards and Benchmarks	
	68.04 Use a problem-solving method to debug hardware issues
69.0	Explore the characteristics, tasks, work attributes, options, and tools associated with AI-enabled careers and educational pathways to achieve these career goals. The student will be able to:
	69.01 Explore a variety of careers that leverage AI tools and systems.
	69.02 Discuss the impact of AI on business and commerce.
	69.03 Evaluate the impacts of irresponsible use of AI technologies.
	69.04 Identify tasks performed by AI-enable professionals.
	69.05 Identify and explain the ways businesses use AI to solve business problems.
	69.06 Investigate AI-enabled career opportunities in various businesses, medicine, engineering, construction, science, social services, government, military, computing, education, manufacturing, finance/banking, etc.
	69.07 Explain different specializations and the related training in AI-enabled careers.
	69.08 Explain the need for continuing education and training of AI-enabled professionals.
	69.09 Explain how AI is used in enterprise software systems and how insights from AI impact decision-making.
	69.10 Describe ethical responsibilities of AI-enabled professionals.
	69.11 Identify credentials and certifications that may improve employability for an AI-enabled professional.
	69.12 Identify devices, datasets, tools, and other environments for which AI-enabled professionals may use, modify, and develop AI systems.
	69.13 Learn that people in various work roles engage in continuous learning to upgrade skills and adapt to change.
	69.14 Explore a variety of careers that leverage AI tools and systems.
	69.15 Discuss the impact of AI on business and commerce.
	69.16 Evaluate the impacts of irresponsible use of AI technologies.
	69.17 Identify tasks performed by AI-enable professionals.
70.0	Use appropriate tools to design an AI System to solve problems. The student will be able to
	70.01 Select a dataset that is appropriate for a given AI application.
	70.02 Curate and clean a dataset for use.
	70.03 Employ one or more technological tools in machine learning such as natural language processing, ensemble learning, signal processing, computer vision, optical character recognition, etc. to expedite workflow.
	70.04 Apply an ethical development process to create, analyze and iterate an AI-enabled solution, individually and collaboratively.
	70.05 Be cognizant of the range of tools and services available for AI-enabled professionals and AI experts/developers/engineers.

CTE Standards and Benchmarks	
	70.06 Determine the computing resources (e.g., desktop vs GPU) and time needed (e.g., minutes, hours, days, weeks) to complete a ML/AI task.
	70.07 Identify and research networks and cloud services that use AI solutions (e.g., machine learning, data management, edge AI, and various industry-specific solutions and services).
	70.08 Identify AI in a variety of industry solutions and services and make appropriate recommendations of AI applications based on an industry need.
71.0	Set up and use a machine learning (ML) pipeline to solve a problem. The student will be able to:
	71.01 Identify a problem that can be solved with machine learning.
	71.02 Use appropriate techniques and best practices for selection, collection, and/or curation of data to gain insight on a problem.
	71.03 Use appropriate techniques and best practices for selection of algorithms and architectures to develop and train a model to solve a problem.
	71.04 Use appropriate tools to evaluate model performance.
	71.05 Use appropriate tools and techniques to deploy the model.
	71.06 Evaluate the important issues related to privacy and security in the development, deployment, and usage of ML models.
	71.07 Demonstrate awareness of the issues that arise in model use (e.g., model drift) and best practices for maintaining the accuracy of deployed models.
	71.08 Demonstrate awareness that training a machine learning model is an iterative process that requires time and compute resources.
72.0	Appropriately use automated services to accomplish common tasks. The student will be able to:
	72.01 Train an ML model and deploy the model as a service.
	72.02 Select and use appropriate techniques for setting up a workspace, create computing resource, and exploring data.
	72.03 Create and run a training pipeline, evaluate a regression model, create an inference pipeline, and deploy a predictive service.
	72.04 Select and use appropriate services to • Create a regression model that predicts numeric values. • Create a clustering model that groups similar entities based on their features. • Create a classification model that predict categories or classes. • Detect and analyze faces. • Detect, analyze, and classify images. • Read and analyze text. • Recognize, synthesize, and/or translate speech. • Generate a language model. • Build a Q&A chatbot.
73.0	Use data analysis and visualization tools to work with datasets and gain insights. The student will be able to:

CTE Standards and Benchmarks	
	73.01 Use good practices for statistical sampling, testing, and incorporation of uncertainties in estimation using margins of error or interval estimates to accurately analyze data.
	73.02 Apply statistics to find patterns in data.
	73.03 Apply data analysis techniques to discover new information and guide decision-making.
	73.04 Explore and utilize packages for data analysis and manipulation before training a machine learning model (e.g., Pandas).
	73.05 Apply techniques for exploration and analysis of single, pair, and multi-feature models.
	73.06 Construct an ML model based on a dataset that trains the algorithm on how to make decisions.
	73.07 Tell a data story using appropriate visualizations that are clear, compelling and accessible for the audience (e.g., infographics, charts, graphs, interactive dashboards, etc.).
74.0	Apply the machine learning life cycle in the development and use of a machine learning model. The student will be able to:
	74.01 Identify and evaluate a problem appropriate for solving by machine learning.
	74.02 Describe the data pipeline steps, including data collection, manipulation, cleansing, and transformation.
	74.03 Understand how to make sure each step in the data pipeline is carried out ethically and responsibly.
	74.04 Identify biases and ethical factors to consider when evaluating sources of data.
	74.05 Locate data from reliable sources.
	74.06 Find, convert, clean, and label the data features.
	74.07 Evaluate, select, and test an appropriate model.
	74.08 Select and justify the appropriateness of the learning algorithm for the particular problem and data.
	74.09 For classification problems, define and distinguish between balanced and imbalanced datasets, and identify potential issues with imbalanced datasets.
	74.10 Define and explain the differences among training, validation, and test datasets.
	74.11 Explain and demonstrate the ways training data influences learning and decisions made by the model.
	74.12 Experiment by adjusting hyper-parameters to tune the model.
	74.13 Use a cross-validation set to determine when training should stop to avoid overfitting.
	74.14 Use a test set to measure performance of the machine learning model.
	74.15 Select appropriate metrics to evaluate success of the model: setting criteria, what to do when it fails in lab; fails in field. This can be done by an independent group for high-stakes applications.
	74.16 Use appropriate tools to deploy and use the machine learning model.
	74.17 Monitor model use over a span to time to evaluate its effectiveness on unseen data and make improvements.

CTE Standards and Benchmarks	
75.0	Design and develop AI systems to solve a problem or design solutions for social and ethical issues. The student will be able to:
75.01	Define and research a real social or ethical problem in the community that could be enhanced or solved with AI.
75.02	Use a problem-solving process (e.g., design thinking) to collaboratively investigate the identified problem and define requirements.
75.03	Analyze the requirements and translate the design vision to build complete end-to-end AI solutions.
75.04	Define and apply a team-based software development process to collaboratively design a solution that uses AI for the problem.
75.05	Identify and use IDEs, APIs, and packages in program development to build and train machine learning models.
76.0	Create a portfolio of AI projects that demonstrate ability to program machine learning models using a wide range of AI algorithms. The student will be able to:
76.01	Identify common vendors of cognitive services, machine learning, and knowledge mining available to architect and implement AI systems involving natural language processing, speech, computer vision, and conversational AI.
76.02	Analyze requirements for AI solutions, recommending the appropriate tools and technologies to solve a problem.
76.03	As applicable, explain the architecture, development process, and build: • A chatbot. • A recommender system. • An application of natural language processing. • An application of computer vision.
76.04	As applicable, apply or construct: • Regression modeling to make a time-series prediction model. • Naïve Bayes, K-nearest neighbor, or support vector machines, etc. to develop a classification model. • Random forest and/or the accompanying boosting algorithms, e.g., XGBoost and AdaBoost in ensemble learning. • Isolation forests, PCA, or K-means clustering to develop an anomaly detection model.
76.05	Regression modeling to make a time-series prediction model.
76.06	Naïve Bayes, K-nearest neighbor, or support vector machines, etc. to develop a classification model.
76.07	Random forest and/or the accompanying boosting algorithms, e.g., XGBoost and AdaBoost in ensemble learning.
76.08	Isolation forests, PCA, or K-means clustering to develop an anomaly detection model.
77.0	Research and evaluate various AI careers involved in AI system usage, design, development, deployment, and maintenance. The student will be able to:
77.01	Explain the roles, responsibilities, tools, skills, expertise, and education needed for AI researchers to develop new machine learning algorithms, architectures, applications, and approaches to solve challenging problems.
77.02	Explain the roles, responsibilities, tools, skills, expertise, and education needed for AI or machine learning engineers to architect and implement AI algorithms, models, and systems.
77.03	Explain the roles, responsibilities, tools, skills, expertise, and education needed for AI solutions architect to design AI systems that meet the business needs for customers.

CTE Standards and Benchmarks	
77.04	Explain the tools, skills, expertise, and education needed for data scientists to train machine learning models that can make predictions and inferences based on the relationships they find in the data.
77.05	Explain the roles, responsibilities, tools, skills, expertise, and education needed for data engineers to design and implement the management, monitoring, security, and privacy of data solutions.
77.06	Explain the roles, responsibilities, tools, skills, expertise, and education needed for database administrators to implement and manage cloud and on premises databases that work with AI-base data services.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Information & Communications Technology (ICT) Essentials**
Program Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Program Number	9009100
CIP Number	149009100M
Grade Level	6-8
Program Length	Year
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to provide students with the computer, digital, and information technology skills necessary for success in their future academic and occupational goals. In addition to fundamental computer information, the content includes but is not limited to digital technologies associated with web development, multimedia, word processing, spreadsheet, database, Internet communications, cybersecurity, and computer programming.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Program Structure

This program is a planned sequence of instruction consisting of three course(s).

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the program structure:

Course Number	Course Title	Teacher Certification	Length
9009110	Information & Communications Technology (ICT) Essentials 1	BUS ED 1 @2	Year

Course Number	Course Title	Teacher Certification	Length
9009120	Information & Communications Technology (ICT) Essentials 2	COMPU SCI 6 INFO TECH 7G WEB DEV 7G	Year
9009130	Information & Communications Technology (ICT) Essentials 3		Year

Florida Department of Education
Student Performance Standards

Course Title: **Information & Communications Technology (ICT) Essentials 1**
Course Number: **9009110**
Course Length: **Year**
Grade: **6-8**

Course Description:

This course introduces students to core concepts associated with computers and their use. The content includes hands-on opportunities to explore various software applications.

CTE Standards and Benchmarks	
01.0	Identify computer components and their functions. The student will be able to:
01.01	Describe what defines a computer and ways a computer can be used.
01.02	Identify the internal components of a computer (e.g., case, CPU, RAM, power supply, hard drive, motherboard, expansion cards, cabling).
01.03	Identify and know how to connect various computer input devices (e.g., mouse, keyboard, phone, camera, scanner, microphone, game controller, stylus, barcode reader finger print scanner, GPS device, touch pad, graphics tablet) and describe their use.
01.04	Identify and know how to connect various computer output devices (e.g., monitor, printer, projector, speakers, headphones) and describe their use.
01.05	Identify and know how to connect various storage devices (e.g., flash drive, external hard drive (SSD, network drive), memory card, discs, cloud).
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Compare and contrast various operating systems used in a computer and mobile devices (i.e., Windows, OS (Apple), UNIX, Android, iOS).
02.02	Describe and use conventional file naming conventions.
02.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
02.04	Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls).
02.05	Demonstrate proficiency in using gadgets, icons, and taskbars and other pre-loaded operating system programs. (e.g., calculator, text editor, clock, volume controls, adding icons and shortcuts to taskbar and shortcut menus).
03.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:

	03.01	Describe risks associated with social networking sites (e.g., FaceBook, Snapchat, Instagram, Twitter) and ways to reduce these risks.
	03.02	Define “privacy” and relate it to the term “digital footprint”.
	03.03	Practice cybersafety techniques to protect your personal information when using internet searches, email, chat rooms, and social network websites.
	03.04	Describe cyberbullying, its impact on perpetrators and victims and ways to respond.
	03.05	Describe risks associated with sexting (including legal issues, social consequences), and discuss methods for response, reporting, and prevention.
	03.06	Describe risks associated with online gaming, and identify ways to reduce these risks.
	03.07	Discuss issues related to downloading music or videos from the Internet, including unethical vs. illegal actions.
	03.08	Compare and contrast rules for copyright and fair use, especially in relation to using online resources for school and educational purposes.
	03.09	Distinguish between viruses and malware and discuss their impact on personal privacy and computer operation.
	03.10	Describe common threats used to spread malware and viruses, including phishing, pharming, Trojans, spyware, malicious sites, “free” downloads.
	03.11	Perform an antivirus scan on a computer system to check for viruses and malware.
	03.12	Describe strong password practices.
	03.13	Practice cyber safety techniques to protect your computer system when using Internet searches, email and social network websites.
	03.14	Identify security issues related to mobile phones, including personal information compromised if a phone is lost or stolen.
	03.15	Adhere to Acceptable Use Policies when accessing the Internet.
04.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:	
	04.01	Identify and use web terminology (WWW, Web Browser, Internet, Web Server, Web Page, Address Bar, Hyperlinks, Navigation Buttons, Search Bar, Bookmarks/Favorites, Tab, Downloading, Plug-ins, Social Media Plug-ins).
	04.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).
	04.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	04.04	Demonstrate proficiency using search engines, including Boolean search techniques.
	04.05	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF).
	04.06	Compare and contrast the roles of web servers and web browsers.

	04.07	Evaluate online information for relevance, credibility and quality using basic guidelines and indicators (e.g. authority, affiliation, purpose, bias, date).
	04.08	Identify and apply copyright and fair use guidelines, and explain plagiarism as an ethical and legal violation.
	04.09	Incorporate results from Internet searches into a research project (e.g., report, summary).
	04.10	Download images as needed to support a research project, complying with copyright notices.
	04.11	Properly cite Internet sources used to obtain information for a research project.
05.0	05.0	Demonstrate proficiency in using word processing software. The student will be able to:
	05.01	Describe the general functions of word-processing software, including benefits for document creation, commonly used word-processing applications.
	05.02	Define the term “cloud computing,” and explain benefits of creating and storing word-processing documents online.
	05.03	List and describe common word processor interface tools and features.
	05.04	Identify common keyboard shortcuts used in word processors, and explain the benefits of using shortcuts.
	05.05	Format the page setup of a document, including margins, line spacing, indents, headers vs. footers, orientation.
	05.06	Explain printing options in a word processor, including shrink-to-fit, 2-sided printing, and document orientation.
	05.07	Copy, paste and move text within a document using mouse, menu and keyboard techniques.
	05.08	Copy, paste and move text among multiple documents using mouse, menu and keyboard techniques.
	05.09	Modify document view settings to display close-up, single and multiple pages.
	05.10	Define the term “format” as it relates to word processing.
	05.11	Format text using styles and font tools in a word processor.
	05.12	Format a document using multi-level heading styles to enable an outline view (e.g. document map, navigation pane) in a word processor.
	05.13	Create a table of contents using auto-generation tools and techniques in a word processor.
	05.14	Insert page breaks in a document.
	05.15	Create source citations and/or a bibliography in a document.
	05.16	Insert a current date and time stamp into a document.

05.17	Use word processor tools to determine the number of pages, words and characters in a document.
05.18	Use spell check, grammar check, thesaurus, and find and replace to edit a document.
05.19	Insert and modify sizing of images in a word-processing document.
05.20	Position an image relative to text in a document, using various text-wrapping options (inline, square, tight).
05.21	Use word-processing drawing tools to create pre-formatted shapes that enhance a document's content.
05.22	Use word-processor drawing tools to create a visual representation of information (e.g. SmartArt), such as diagram, flow chart.
05.23	Apply a column layout to text in a document as appropriate for the content (e.g., article, newsletter).
05.24	Apply simple numbered and bulleted lists in a document to make content easier to read and understand.
05.25	Format numbered and bulleted lists to produce multi-level outline in a document.
05.26	Create a simple brochure and/or flyer using a template.
05.27	Create a table in a word-processing document, and enter and move data in the table.
05.28	Convert a body of text into a table structure in a document to make content easier to read and understand.
05.29	Define "collaboration" and explain ways that users can collaborate on word-processing documents, including installed software vs. cloud-based software, real-time collaboration, auto save, sharing tools, revision history.
05.30	Use the translation tool in a word processor to translate text in a document from English into another language, and vice versa.
05.31	Add comments to a document when reviewing and/or editing content.
05.32	Revise a document using editing tools (e.g. Track Changes) in a word processor, and accept or reject changes as appropriate.
06.0	Demonstrate proficiency in using presentation software. The student will be able to:
06.01	Describe presentation software and the ways it can be used.
06.02	Create and/or modify a "slide master" or template to apply a consistent appearance to a presentation.
06.03	Add and format titles, subtitles and talking points in presentation slides.
06.04	Add slide numbers and/or date and time codes to presentation slides.
06.05	Insert and format images/graphics in presentation slides.
06.06	Insert new or duplicate slides in a presentation.

	06.07 Modify slide transitions in a presentation to include animation.
	06.08 Insert and/or modify sound settings and timing in a presentation.
	06.09 Modify the sequence of slides in a presentation.
	06.10 Produce a presentation that includes text, graphics and images, and present it.
	06.11 Modify a presentation's setup to repeat (i.e., loop) the presentation continuously.
07.0	Demonstrate proficiency in using graphics software. The student will be able to:
	07.01 Describe graphics software and the ways it can be used.
	07.02 Compare and contrast vector and raster images.
	07.03 Identify image file formats for photos and graphical art (e.g., TIFF, BMP, PSD, EPS, JPEG, GIF, PNG), and specify which formats are supported on the web.
	07.04 Define terms related to the creation and display of graphical images (e.g., raster, vector, transparency, opacity, cropping, lasso, magic wand, marquee, canvas size, flattened, blur, dodge, sharpen, staking order, free transform, lossless, adjustments, move, clone, zoom, layers, filter, distort).
	07.05 Create images with effects using different tools, brushes, adjustments and filters available in graphics software.
	07.06 Copy and paste graphical images.
	07.07 Modify shapes and colors in a graphical image.
	07.08 Save and export a digital photograph in a format that provides the best image quality and file size for Internet use.
	07.09 Create a progressive slide presentation using graphical design/layout template features (e.g., SmartArt) and animated transitions.
	07.10 Use a portable digital video device (e.g., mobile phone, flip camera) or similar online tools to shoot video files, and transfer them to a computer.
	07.11 Use video-editing software to produce a slide show or movie.
	07.12 Create a multimedia presentation that incorporates edited video, animation, music and/or narration, and that applies principles of good design, smooth transitions and effective message delivery.
08.0	Demonstrate appropriate use of email. The student will be able to:
	08.01 Define "email "and describe the functions and advantages as a form of communication.
	08.02 Identify components of an email message.

08.03	Explain the format of an email address (i.e., user name, @ symbol, domain).
08.04	Attach a file to an email message.
08.05	Reply to and forward an email message to one or more addressees.
08.06	Use the Internet to perform email activities (i.e., web-based email).
08.07	Identify the appropriate use of email and demonstrate related email etiquette.
08.08	Perform email organization and cleanup (e.g., trash, flags, create folders).

Florida Department of Education
Student Performance Standards

Course Title: **Information & Communications Technology (ICT) Essentials 2**
Course Number: **9009120**
Course Length: **Year**
Grade: **6-8**

Course Description:

This course builds on the previous course and provides greater depth and more complex concepts and the skills/knowledge to master these concepts. Students will be provided opportunities to extend their skills with various software applications by creating more complex documents and using more complex functions.

CTE Standards and Benchmarks	
09.0	Demonstrate knowledge of safety and privacy practices for online communication. The student will be able to:
09.01	Define “privacy” and relate it to the term “digital footprint.”
09.02	Describe the risks of communicating on social networking sites (e.g. Facebook, Twitter, Instagram) and identify ways to communicate safely.
09.03	Distinguish between copyright infringement, plagiarism and fair use in an educational setting and in relation to school projects, especially with music and pictures.
09.04	Describe online communication practices that contribute to cyberbullying.
09.05	Practice safe online communication techniques with Internet searches, email, chat rooms, and other social network websites.
09.06	Follow an Acceptable Use Policy (AUP) when accessing the Internet.
10.0	Develop and apply fundamental spreadsheet skills. The student will be able to:
10.01	Define “spreadsheet” and describe ways it may be used.
10.02	Identify the parts of the spreadsheet display, including cells, columns and rows, cell references, cell range.
10.03	Create and navigate through multiple spreadsheets in a file.
10.04	Insert and format various types of data (text, numeric, date/time) in a spreadsheet cells.
10.05	Select multiple cells, including adjacent and non-adjacent ranges, using mouse and keyboard techniques.
10.06	Cut, copy, and paste information from one or more cells to another part of the spreadsheet.

CTE Standards and Benchmarks	
	10.07 Use the undo and redo tools in a spreadsheet.
	10.08 Apply and modify cell formatting for currency, date and percentage values.
	10.09 Resize column width and row height in a spreadsheet.
	10.10 Insert and delete columns and rows in a spreadsheet.
	10.11 Merge and unmerge cells in a spreadsheet.
	10.12 Apply shading and borders to a spreadsheet.
	10.13 Describe the purpose of a table and how it relates to a spreadsheet.
	10.14 Create and print a table and/or range that displays and sums the values of different data types.
	10.15 Identify various types of charts (e.g., line, bar, pie, scatter) and common chart components (e.g., vertical axis, horizontal axis, legend), and explain when to use each chart type.
	10.16 Create a chart from existing data and format the pieces (data set), change the background color, and add appropriate titles and a legend.
	10.17 Use the auto sum function to calculate the values of multiple cells.
	10.18 Insert common functions (SUM, AVERAGE, COUNT, MAX, MIN) and simple mathematical formulas which include addition, subtraction, multiplication, or division into a spreadsheet.
	10.19 Distinguish between absolute and relative cell references in a spreadsheet.
	10.20 Use the sort function to organize information numerically or alphabetically, including multiple levels of sorting.
	10.21 Use the filter function to display spreadsheet data based on specific criteria.
	10.22 Use conditional formatting to highlight text in a spreadsheet.
11.0	Develop and apply database skills. The student will be able to:
	11.01 Define database and describe real-world uses (e.g. search engines, schools, drivers licenses & car registrations, hospitals, retail, law enforcement).
	11.02 Distinguish between databases and spreadsheets.
	11.03 Identify advantages of using a database instead of alternatives (e.g., spreadsheets, electronic documents, paper).
	11.04 Define “Big Data” and describe how it is used in advertising.
	11.05 Identify the components of a database.

CTE Standards and Benchmarks	
11.06	Distinguish between fields and records in a database.
11.07	Describe the basic data types and formats used in a database.
11.08	Distinguish between a table and a query.
11.09	Identify database keys, including primary and foreign.
11.10	Identify the relationships between tables in databases (i.e., one-to-one, one-to-many, many-to-many).
11.11	Distinguish between a query and a report.
11.12	Identify various report types.
11.13	Describe Structured Query Language (SQL) and discuss its use with databases.
11.14	Identify and compare various database applications, including Microsoft Access, MySQL, Oracle.
11.15	Create a database table that uses multiple data types.
11.16	Add, Edit, and Delete records from a database table.
11.17	Sort records in a database query or table.
11.18	Troubleshoot common database errors, including data type errors, query syntax errors.
11.19	Create a basic select query in one table.
11.20	Create an action query to manipulate data.
11.21	Create a query using primary and foreign keys.
11.22	Create a simple table join.
11.23	Import and export data from a database into a spreadsheet.
11.24	Create relevant reports from a database.
12.0	Demonstrate skill in using video editing software and equipment. The student will be able to:
12.01	Demonstrate ability to operate a video camera (e.g., Flip camera, cell phone).
12.02	Write storyboards to depict a one minute video segment.

CTE Standards and Benchmarks	
	12.03 Determine appropriate lighting needs.
	12.04 Create video shots sufficient to produce a one minute video.
	12.05 Identify the functions and benefits of the digital video software interface.
	12.06 Demonstrate ability to edit, cut, erase, and insert video.
	12.07 Edit video as needed to achieve desired message and length.
	12.08 Describe a first complete run-through of the video production process.
	12.09 Characterize the qualities of effective communication in a completed video.
	12.10 Upload finished video files to a website.
13.0	Demonstrate proficiency in using audio editing software (e.g., Audacity). The student will be able to:
	13.01 Identify the functions and benefits of the audio editing software interface.
	13.02 Demonstrate ability to edit, cut, erase, and insert audio.
	13.03 Edit audio as needed to achieve desired message and length.
	13.04 Prepare a 30 second to 1 minute audio commercial project.
14.0	Demonstrate proficiency locating, gathering, and preparing textual, graphical, and image-based web content. The student will be able to:
	14.01 Define the elements of a webpage and what makes a good webpage.
	14.02 Describe effective text and image content for webpages based on how visitors use the web.
	14.03 List guidelines and conventions for effective text on webpage.
	14.04 Explain the inverted pyramid model of newspaper journalism and how it applies to web content.
	14.05 Use word-processing software to create effective written content for a webpage.
	14.06 Create and/or edit message-driven image content for a webpage using graphics software.
	14.07 Access graphics through various recourses (e.g., scanner, digital camera, CD-ROM, clipart, copyright-free online graphics).
	14.08 Plan the content and design of a basic webpage using strategies for effective Web communication, including brainstorming, determining audience, choosing content and media types, using white space.

Florida Department of Education
Student Performance Standards

Course Title: **Information & Communications Technology (ICT) Essentials 3**
Course Number: **9009130**
Course Length: **Year**
Grade: **6-8**

Course Description:

This course builds on the previous two courses and provides greater depth and more complex concepts and the skills/knowledge to master these concepts. In addition to working with network concepts, students will be provided opportunities to further extend their skills with various software applications by creating more complex documents and using more complex functions and technologies. Students will continue their exposure to computer programming and the creation of more complex computer programs. For the programming instruction, the use of Alice from Carnegie Mellon University is encouraged as it is a highly engaging program, includes instructional materials, and is available at no cost.

CTE Standards and Benchmarks	
15.0	Use Web 2.0 or Internet-based collaborative technology (e.g., Wikis, Wimba, Moodle, Edmodo, Facebook, Schoology, Gaggle) to facilitate a web development or research project. The student will be able to:
15.01	Create and use a collaborative environment for communicating and sharing among project team members.
15.02	Create and use a social media page (e.g., Wikis, Wimba, Moodle, Edmodo, Facebook, Schoology, Gaggle) to share and publish project components (e.g., content, images, graphics, videos) for gauging visitor reaction and obtaining feedback.
16.0	Demonstrate an understanding of computer networks. The student will be able to:
16.01	Define “network” and give examples of networks used at home, school, and work.
16.02	Compare types of networks, including LAN, WAN, MAN, VPN, intranet, extranet, the Internet.
16.03	Compare common network topologies, including bus, star, ring, mesh.
16.04	Compare various network models and their advantages, including client/server, mainframe/terminal, peer-to-peer.
16.05	Compare various methods and media for network connections, including broadband, wireless, Bluetooth, cellular, satellite.
16.06	Describe the functions of various network hardware devices, including NIC, hub, switch, router, bridge, gateway, access point.
16.07	Describe the purpose of protocols, and identify the protocols commonly used in networks, including TCP/IP, DHCP, DNS, HTTP, FTP, IMAP, POP, SMTP.
16.08	Describe the purpose and function of IP addressing and distinguish between public and private IP addresses.

CTE Standards and Benchmarks	
16.09	Describe the OSI reference model and its layers, including tracing the flow of data between two network nodes through the OSI layers.
17.0	Demonstrate proficiency in webpage development. The student will be able to:
17.01	Identify website domains, and relate a site's domain to its purpose.
17.02	Relate basic components of a webpage (e.g. color, space, written content, typography, images, links, multimedia) to aesthetic, functional and/or usable design principals.
17.03	Define aesthetic design, and explain how aesthetics can affect a visitors' perception of a website's information.
17.04	Demonstrate knowledge of color wheel concepts and effective use of color on a website.
17.05	Compare functional and usable design principles, and explain how usability can affect a website's success.
17.06	Critique the aesthetic design, usability and accessibility of sample websites.
17.07	Define multimedia, and identify its role in webpage interactivity.
17.08	Explain the primary steps of the website planning process.
17.09	Apply the website planning process to plan the design for basic website.
17.10	Build the site navigation scheme for a website.
17.11	Compare webpage creation using an HTML text editor to using a graphical user interface (GUI) editor.
17.12	Compare website creation using an online site builder, an offline site builder and a content management system (CMS).
17.13	Modify an existing webpage template to create an effective look and feel for a website.
17.14	Create a website using a template.
17.15	Define "HTML (Hypertext Markup Language)" and related terms, including tag vs. element, container vs. empty tag, block-level vs. inline element, attribute value, semantic tag.
17.16	Identify HTML elements required to create webpage structure.
17.17	Create webpages using basic HTML tags (e.g., headings, lists, character styles, text alignment, tables, comments).
17.18	Use HTML to create hyperlinks to external sites.
17.19	Use HTML to insert common image file formats into webpages, and use an image as a hyperlink.

CTE Standards and Benchmarks	
	17.20 Explain Cascading Style Sheet (CSS) technology.
	17.21 Apply CSS styles to an HTML page.
	17.22 Create and/or edit animation files, and integrate them into a webpage.
	17.23 Create and/or edit video files, and integrate them into a webpage.
	17.24 Use Dynamic HTML (DHTML) to enhance webpage interactivity.
	17.25 Create and use a wiki or similar tool for collaborating among project team members.
	17.26 Create and use a social media page (e.g., Facebook, Wimba, Edmodo) and/or a blog to share content and collaborate on projects.
	17.27 Review webpage content, verify copyright restrictions, and create meta-data before publishing a site to the internet.
	17.28 Test webpages for display, functionality, and accessibility before publishing a site to the Internet.
	17.29 Validate webpage code using W3C validation tools before publishing a site to the Internet.
	17.30 Describe network issues relating to websites, including bandwidth, compression, streaming, web hosting.
	17.31 Explain the purpose of File Transfer Protocol (FTP) in accessing information on the Internet.
	17.32 Publish a website using FTP.
	17.33 Describe website security methods, including secure server vs. unsecured served, SSL, SSH, encryption.
18.0	Demonstrate proficiency in game development. The student will be able to:
	18.01 Describe the role of games in modern society (e.g., education, task training, social networking, therapy, recreation).
	18.02 Identify various types of games (e.g., chance, skill, knowledge, role-playing, and storytelling).
	18.03 Identify the steps of the design process for creating a game.
	18.04 Apply the design process to solving a problem.
	18.05 Analyze (deconstruct) existing games.
	18.06 Identify the tools and skills needed for creating games.
	18.07 Identify design criteria and constraints.

CTE Standards and Benchmarks	
18.08	Create storyboards to model a game's program flow and functionality.
18.09	Identify the programmer's role in creating games.
18.10	Identify common programming languages and applications used to create computer games.
18.11	Compare sequential, iteration (loop) and selection programming structures.
18.12	Define the term algorithm (i.e., a set of repeatable steps) and how it applies to problem solving.
18.13	Create an algorithm to solve a problem or complete a task.
18.14	Use pseudo-code to model a game program's flow.
18.15	Define logic errors and identify them in a game program or model.
18.16	Explain the types and uses of variables in game programming.
18.17	Describe basic Boolean concepts, including logical operators, order of precedence, expressions.
18.18	Describe the use of events, event handlers and functions in game programming.
18.19	Describe the use of parameters and arguments in game programming.
18.20	Describe the use of objects, classes and instances in game programming.
18.21	Describe the use of properties and methods with objects in game programming.
18.22	Write appropriate code to create a simple game using structured programming.
18.23	Test and evaluate the game program you created.
18.24	Modify the game program as needed to solve a problem.
18.25	Create an animated object (i.e., sprite) to be used in a game program.
18.26	Use programming code to control the behavior of an animated object (i.e., sprite) in a game program.
19.0	Demonstrate proficiency in basic programming. The student will be able to:
19.01	Define "programming" and discuss its role in computing.
19.02	Explain the binary representation of data and programs in computers.
19.03	Distinguish among the three types of programming languages (machine, assembly, high-level), and give examples.

CTE Standards and Benchmarks	
19.04	Compare and contrast languages that are usually compiled (e.g., C++, Java) and interpreted (e.g., JavaScript, Python).
19.05	Describe the structure of a simple program, and explain why sequencing is important.
19.06	Write a program design document using pseudo-code that shows program flow.
19.07	Explain strategies used in problem-solving, and relate them to computer programming.
19.08	Define the term “algorithm,” and explain how it relates to problem-solving.
19.09	Explain the three types of programming errors (i.e., logic, syntax, runtime), and describe the forms of testing that can be used to locate and debug errors.
19.10	Solve a problem using logic by planning a strategy, designing and testing a hypothesis, and/or creating a set of step-by-step instructions to perform a task.
19.11	Define “structured programming” and discuss the advantages of this approach.
19.12	Define the three main programming control structures used in structured programming: sequential, selection (decision), and iteration (loops).
19.13	Describe iterative programming structures (e.g., while, do/while) and how they are used in programming.
19.14	Describe selection programming structures (e.g., if/then, else) and explain the logic used for if statements.
19.15	Write a simple program in pseudo-code that uses structured programming to solve a problem.
19.16	Explain the types and uses of variables in programming.
19.17	Explain basic object-oriented concepts.
19.18	Describe fundamental Boolean concepts, including Boolean algebra, operators, logic.
19.19	Create animated objects using a high-level programming environment (e.g., Alice, Greenfoot) to control their behavior.
19.20	Create a simple program that uses animated objects.
19.21	Convert a simple program from pseudo-code into a common high-level programming environment (e.g. Alice, Greenfoot).
19.22	Troubleshoot and debug errors in code.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Coding Fundamentals**
Course Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Course Number	9009200
CIP Number	0511020109
Grade Level	6-8
Course Length	Semester/Year
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, TSA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist Information Technology students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the career cluster. The content includes but is not limited to foundational knowledge and skills related to computer coding and software development. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

This course provides foundational knowledge toward SOC codes 15-1132 Software Developers, Applications and 15-1131 Computer Programmers.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course Structure

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9009200	Coding Fundamentals	BUS ED 1@2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G COMP PROG 7G	Semester/Year

Standards:

After successfully completing this course, the student will be able to perform the following:

01.0 Demonstrate proficiency using specialized computer coding software.
02.0 Develop an awareness of programming languages.
03.0 Demonstrate proficiency using common software applications.
04.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance.
05.0 Demonstrate comprehension and communication.
06.0 Demonstrate knowledge of different operating systems.
07.0 Demonstrate proficiency in basic programming.

Florida Department of Education
Student Performance Standards

Course Title: **Coding Fundamentals**
Course Number: **9009200**
Course Length: **Year**

CTE Standards and Benchmarks	
01.0	Demonstrate proficiency using specialized computer coding software. The student will be able to:
01.01	Use specialized computer coding software to solve problems.
01.02	Demonstrate proficiency using specialized computer software (e.g., Swift, Python).
02.0	Develop an awareness of programming languages. The student will be able to:
02.01	Identify programming language design approaches.
02.02	Explain the components of programming languages.
02.03	Examine connections between elements of mathematics and computer science including binary numbers, logic, sets, and functions.
03.0	Demonstrate proficiency of using common software applications. The student will be able to:
03.01	Compare and contrast the appropriate use of various software applications.
03.02	Demonstrate proficiency in the use of various software applications.
03.03	Explain why different file types exist (e.g., formats for word processing, images, music, and three-dimensional drawings).
03.04	Identify the kinds of content associated with different file types.
04.0	Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. The student will be able to:
04.01	Develop keyboarding skills to enter and manipulate text and data.
04.02	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
04.03	Perform a variety of operations such as sorting, filtering, and searching in a database to organize and display information in a variety of ways such as number formats (e.g., scientific notation, percentages, and exponents) charts, tables and graphs.
05.0	Demonstrate comprehension and communication. The student will be able to:

CTE Standards and Benchmarks	
05.01	Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively.
05.02	Organize ideas and communicate oral and written messages.
05.03	Collaborate with individuals and teams to complete tasks and solve information technology problems.
05.04	Demonstrate an awareness of project management concepts and tools.
05.05	Demonstrate an ability to communicate appropriately through various online tools.
05.06	Recognize that more than one algorithm can solve a given problem.
05.07	Create a program that implements an algorithm to achieve a given goal, individually and collaboratively.
06.0	Demonstrate knowledge of different operating systems. The student will be able to:
06.01	Compare and contrast various operating systems used in a computer and mobile devices (i.e., Windows, OS (Apple), UNIX, Android, iOS).
06.02	Demonstrate proficiency in using gadgets, icons, and task bars and other pre-loaded operating system programs (e.g., calculator, text editor, clock, volume controls, adding icons and shortcuts to task bar and shortcut menus).
06.03	Use iterative development and debugging to explore the problem domain.
07.0	Demonstrate proficiency in basic programming. The student will be able to:
07.01	Describe the structure of a simple program, and explain why sequencing is important.
07.02	Define the term “algorithm,” and explain how it relates to problem-solving.
07.03	Describe iterative programming structures (e.g., while, do/while) and how they are used in programming.
07.04	Describe selection programming structures (e.g., if/then, else) and explain the logic used for if statements.
07.05	Explain the types and use of variables in programming.
07.06	Write a simple program in pseudo-code that used structured programming to solve a problem.
07.07	Troubleshoot and debug errors in code.
07.08	Create, modify, and use a database (e.g., define field formats, adding new records, manipulate data) to analyze data and propose solutions for a task/problem, individually and collaboratively.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Exploring Information Technology Careers**
Course Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Course Number	9009350
CIP Number	149009350M
Grade Level	6-8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Information Technology career cluster. The content includes but is not limited to terminology, careers, history, required skills, and technologies associated with pathways comprising the Information Technology career cluster. Reinforcement of academic skills occurs through classroom instruction and applied laboratory procedures.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9009350	Exploring Information Technology Careers	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7 G WEB DEV 7 G DIGI MEDIA 7 G CYBER TECH 7 G COMP PROG 7 G	Semester

Standards

After successfully completing this course, the student will be able to perform the following:

01.0 Demonstrate an understanding of the Network Systems career pathway.
02.0 Demonstrate an understanding of the Information Support and Services career pathway.
03.0 Demonstrate an understanding of the Web and Digital Communications career pathway.
04.0 Demonstrate an understanding of the Programming and Software Development career pathway.
05.0 Apply leadership and communication skills.
06.0 Describe how information technology is used in the Information Technology career cluster.
07.0 Use information technology tools.

Florida Department of Education
Student Performance Standards

Course Title: **Exploring Information Technology Careers**
Course Number: **9009350**
Course Length: **Semester**

Course Description:

Beginning with a broad overview of the Information Technology career cluster, students are introduced to the terminology, careers, history, required skills, and technologies associated with each pathway in the Information Technology career cluster. Additionally, they will be provided with opportunities to acquire and demonstrate beginning leadership skills.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the Network Systems career pathway. The student will be able to:
01.01	Define and use proper terminology associated with the Network Systems career pathway.
01.02	Describe some of the careers available in the Network Systems career pathway.
01.03	Identify common characteristics of the careers in the Network Systems career pathway.
01.04	Research the history of the Network Systems career pathway and describe how the associated careers have evolved and impacted society.
01.05	Identify skills required to successfully enter any career in the Network Systems career pathway.
01.06	Describe technologies associated in careers within the Network Systems career pathway.
02.0	Demonstrate an understanding of the Information Support and Services career pathway. The student will be able to:
02.01	Define and use proper terminology associated with the Information Support and Services career pathway.
02.02	Describe some of the careers available in the Information Support and Services career pathway.
02.03	Identify common characteristics of the careers in the Information Support and Services career pathway.
02.04	Research the history of the Information Support and Services career pathway and describe how the careers have evolved and impacted society.
02.05	Identify skills required to successfully enter any career in the Information Support and Services career pathway.
02.06	Describe technologies associated in careers within the Information Support and Services career pathway.

CTE Standards and Benchmarks	
03.0	Demonstrate an understanding of the Web and Digital Communications career pathway. The student will be able to:
03.01	Define and use proper terminology associated with the Web and Digital Communications career pathway.
03.02	Describe some of the careers available in the Web and Digital Communications career pathway.
03.03	Identify common characteristics of the careers in the Web and Digital Communications career pathway.
03.04	Research the history of the Web and Digital Communications career pathway and describe how the careers have evolved and impacted society.
03.05	Identify skills required to successfully enter any career in the Web and Digital Communications career pathway.
03.06	Describe technologies associated in careers within the Web and Digital Communications career pathway.
04.0	Demonstrate an understanding of the Programming and Software Development career pathway. The student will be able to:
04.01	Define and use proper terminology associated with the Programming and Software Development career pathway.
04.02	Describe some of the careers available in the Programming and Software Development career pathway.
04.03	Identify common characteristics of the careers in the Programming and Software Development career pathway.
04.04	Research the history of the Programming and Software Development career pathway and describe how the careers have evolved and impacted society.
04.05	Identify skills required to successfully enter any career in the Programming and Software Development career pathway.
04.06	Describe technologies associated in careers within the Programming and Software Development career pathway.
05.0	Apply leadership and communication skills. The student will be able to:
05.01	Discuss the establishment and history of the FBLA/BPA student organizations.
05.02	Identify the characteristics and responsibilities of organizational leaders.
05.03	Demonstrate parliamentary procedure skills during a meeting.
05.04	Participate on a committee which has an assigned task and report to the class.
05.05	Demonstrate effective communication skills through delivery of a speech, a slide presentation, or conducting a demonstration.
05.06	Use a computer to assist in the completion of a project related to the Information Technology career cluster.
06.0	Describe how information technology is used in the Information Technology career cluster. The student will be able to:
06.01	Identify information technology (IT) careers in the Information Technology career cluster, including the responsibilities, tasks and skills they require.

CTE Standards and Benchmarks	
	06.02 Relate information technology project management concepts and terms to careers in the Information Technology career cluster.
	06.03 Manage information technology components typically used in professions of the Information Technology career cluster.
	06.04 Identify security-related ethical and legal IT issues faced by professionals in the Information Technology career cluster.
07.0	Use information technology tools. The student will be able to:
	07.01 Identify the functions of web browsers, and use them to access the World Wide Web and other computer resources typically used in the Information Technology career cluster.
	07.02 Use e-mail clients to send simple messages and files to other Internet users.
	07.03 Demonstrate ways to communicate effectively using Internet technology.
	07.04 Use different types of web search engines effectively to locate information relevant to the Information Technology career cluster.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Exploring Information Technology Careers and Career Planning**
Course Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Course Number	9009360
CIP Number	149009360M
Grade Level	6-8
Course Length	Semester
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Information Technology career cluster. The content includes but is not limited to terminology, careers, history, required skills, and technologies associated with pathways comprising the Information Technology career cluster. Reinforcement of academic skills occurs through classroom instruction and applied laboratory procedures.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9009360	Exploring Information Technology Careers and Career Planning	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7 G WEB DEV 7 G DIGI MEDIA 7 G CYBER TECH 7 G COMP PROG 7 G	Semester

Standards

After successfully completing this course, the student will be able to perform the following:

01.0 Demonstrate an understanding of the Network Systems career pathway.
02.0 Demonstrate an understanding of the Information Support and Services career pathway.
03.0 Demonstrate an understanding of the Web and Digital Communications career pathway.
04.0 Demonstrate an understanding of the Programming and Software Development career pathway.
05.0 Apply leadership and communication skills.
06.0 Describe how information technology is used in the Information Technology career cluster.
07.0 Use information technology tools.

Career and Education Planning [these must be met to satisfy the requirements of Section 1003.4156, Florida Statutes]

08.0 Explain his or her career interests, skills and values.
09.0 Describe occupations and industries in his or her region.
10.0 Describe a variety of postsecondary pathways.
11.0 Create a personalized career and academic plan.

Florida Department of Education
Student Performance Standards

Course Title: **Exploring Information Technology Careers and Career Planning**
Course Number: **9009360**
Course Length: **Semester**

Course Description:

Beginning with a broad overview of the Information Technology career cluster, students are introduced to the terminology, careers, history, required skills, and technologies associated with each pathway in the Information Technology career cluster. Additionally, they will be provided with opportunities to acquire and demonstrate beginning leadership skills.

CTE Standards and Benchmarks	
01.0	Demonstrate an understanding of the Network Systems career pathway. The student will be able to:
01.01	Define and use proper terminology associated with the Network Systems career pathway.
01.02	Describe some of the careers available in the Network Systems career pathway.
01.03	Identify common characteristics of the careers in the Network Systems career pathway.
01.04	Research the history of the Network Systems career pathway and describe how the associated careers have evolved and impacted society.
01.05	Identify skills required to successfully enter any career in the Network Systems career pathway.
01.06	Describe technologies associated in careers within the Network Systems career pathway.
02.0	Demonstrate an understanding of the Information Support and Services career pathway. The student will be able to:
02.01	Define and use proper terminology associated with the Information Support and Services career pathway.
02.02	Describe some of the careers available in the Information Support and Services career pathway.
02.03	Identify common characteristics of the careers in the Information Support and Services career pathway.
02.04	Research the history of the Information Support and Services career pathway and describe how the careers have evolved and impacted society.
02.05	Identify skills required to successfully enter any career in the Information Support and Services career pathway.
02.06	Describe technologies associated in careers within the Information Support and Services career pathway.

CTE Standards and Benchmarks	
03.0	Demonstrate an understanding of the Web and Digital Communications career pathway. The student will be able to:
03.01	Define and use proper terminology associated with the Web and Digital Communications career pathway.
03.02	Describe some of the careers available in the Web and Digital Communications career pathway.
03.03	Identify common characteristics of the careers in the Web and Digital Communications career pathway.
03.04	Research the history of the Web and Digital Communications career pathway and describe how the careers have evolved and impacted society.
03.05	Identify skills required to successfully enter any career in the Web and Digital Communications career pathway.
03.06	Describe technologies associated in careers within the Web and Digital Communications career pathway.
04.0	Demonstrate an understanding of the Programming and Software Development career pathway. The student will be able to:
04.01	Define and use proper terminology associated with the Programming and Software Development career pathway.
04.02	Describe some of the careers available in the Programming and Software Development career pathway.
04.03	Identify common characteristics of the careers in the Programming and Software Development career pathway.
04.04	Research the history of the Programming and Software Development career pathway and describe how the careers have evolved and impacted society.
04.05	Identify skills required to successfully enter any career in the Programming and Software Development career pathway.
04.06	Describe technologies associated in careers within the Programming and Software Development career pathway.
05.0	Apply leadership and communication skills. The student will be able to:
05.01	Discuss the establishment and history of the FBLA/BPA student organization.
05.02	Identify the characteristics and responsibilities of organizational leaders.
05.03	Demonstrate parliamentary procedure skills during a meeting.
05.04	Participate on a committee which has an assigned task and report to the class.
05.05	Demonstrate effective communication skills through delivery of a speech, a slide presentation, or conducting a demonstration.
05.06	Use a computer to assist in the completion of a project related to the Information Technology career cluster.
06.0	Describe how information technology is used in the Information Technology career cluster. The student will be able to:
06.01	Identify information technology (IT) careers in the Information Technology career cluster, including the responsibilities, tasks and skills they require.

CTE Standards and Benchmarks	
	06.02 Relate information technology project management concepts and terms to careers in the Information Technology career cluster.
	06.03 Manage information technology components typically used in professions of the Information Technology career cluster.
	06.04 Identify security-related ethical and legal IT issues faced by professionals in the Information Technology career cluster.
07.0	Use information technology tools. The student will be able to:
	07.01 Identify the functions of web browsers, and use them to access the World Wide Web and other computer resources typically used in the Information Technology career cluster.
	07.02 Use e-mail clients to send simple messages and files to other Internet users.
	07.03 Demonstrate ways to communicate effectively using Internet technology.
	07.04 Use different types of web search engines effectively to locate information relevant to the Information Technology career cluster.

<u>Career and Education Planning</u> [these must be met to satisfy the requirements of Section 1003.4156, Florida Statutes]

Standards and Benchmarks	
08.0	Explain his or her career interests, skills and values. The student will be able to:
	08.01 Describe his or her career interests based on a career interest assessment, personal experience, career informational interviews, research and/or reflection.
	08.02 Describe what career-related skills are his or her current strengths or could become strengths in the future with practice and training based on a career skill assessment, personal experience and/or reflection.
	08.03 Describe what lifestyle and workplace values are most important to them to consider during career decision making, such as salary and benefits, work environment, the nature of the work and work/life balance.
	08.04 Describe what values that relate to positively impacting others and the world are most important to them to weigh during career decision making.
09.0	Describe occupations and industries in his or her region. The student will be able to:
	09.01 Define Career Clusters, industries and occupations.
	09.02 Define regional poverty, average and family-sustaining wage thresholds.
	09.03 Review local labor market data to identify the top five regional occupations as relates to each of the following: employment, growth and salary.
	09.04 List three occupations that align with his or her personal career interests, skills and values.
	09.05 List the regional salary, employment and growth of three occupations they are most interested in learning more about.
	09.06 Summarize occupational content learned through a career informational interview, career fair, job shadowing, service learning, guest speaker, project-based learning, work-based learning, worksite visit or other firsthand experience.

10.0	Describe a variety of postsecondary pathways. The student will be able to:
10.01	Evaluate the pros and cons of pursuing education, employment, entrepreneurship or enlistment immediately following high school.
10.02	Define postsecondary training provider options and their admissions requirements, including apprenticeships, technical colleges, state or community colleges, universities and industry-recognized certification providers.
10.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees
10.04	Explain training options aligned with his or her career assessment results and occupational exploration.
10.05	Review postsecondary training data and list the total cost, average debt after graduation and median earnings and job placement rates of students who completed the student's preferred postsecondary training option.
10.06	Summarize what they learned about his or her preferred postsecondary training provider through online research; virtual or in-person tours; a college fair; and/or interviewing a current student, alumni or staff member.
11.0	Create a personalized career and academic plan. The student will be able to:
11.01	Prioritize an occupation for plan formation using one or more decision making techniques, such as a decision matrix, pros and cons analysis or other means
11.02	Explain the reasoning for choosing to pursue his or her preferred occupation
11.03	Identify which credentials, technical skills, and employability or entrepreneurship skills are relevant to his or her preferred career pathway.
11.04	Prioritize a recognized postsecondary credential (industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees) aligned with his or her chosen occupation using a decision-making technique, such as a decision matrix and/or pros and cons analysis, etc.
11.05	Prioritize a postsecondary training provider aligned with his or her recognized postsecondary credential goal using a decision-making technique, such as a decision matrix and/or pros and cons analysis, etc.
11.06	Define means of paying for postsecondary training, including scholarships (must include State scholarships), grants, savings, work, work-study programs, private loans and Federal loans.
11.07	Describe ways of meeting the requirements of Florida's graduation pathways and obtaining accelerated credit, work-based learning experience, career and technical education credit and industry-recognized certifications in high school.
11.08	Develop a freshman year course schedule that meets high school graduation requirements and that provides academic and career preparation aligned with the student's career goals.
11.09	Identify extracurricular activities aligned with his or her occupational and postsecondary training goals.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career Planning

Effective July 1, 2019, per Section 1003.4156, Florida Statutes (F.S.), for students to meet middle grades promotion requirements, a Career and Education Planning course must be completed in either sixth, seventh, or eighth grade. These courses should be taught integrating the eight career and education planning course standards.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional

methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Information & Communications Technology (ICT) Essentials Careers and Career Planning**
Program Type: **Orientation/Exploratory and Career Planning**
Career Cluster: **Information Technology**

Secondary – Middle School	
Program Number	9009370
CIP Number	14900937MS
Grade Level	6-8
Program Length	Year
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to provide students with the computer, digital, and information technology skills necessary for success in their future academic and occupational goals. In addition to fundamental computer information, the content includes but is not limited to digital technologies associated with web development, multimedia, word processing, spreadsheet, database, Internet communications, cybersecurity, and computer programming.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Program Structure

This program is a planned sequence of instruction consisting of three courses.
To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.
The following table illustrates the program structure:

Course Number	Course Title	Teacher Certification	Length
9009110	Information & Communications Technology (ICT) Essentials 1	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G	Year
9009120	Information & Communications Technology (ICT) Essentials 2		Year
9009140	Information & Communications Technology (ICT) Essentials Careers and Career Planning		Year

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify computer components and their functions.
02.0 Demonstrate knowledge of different operating systems.
03.0 Demonstrate an understanding of Internet safety and ethics.
04.0 Demonstrate proficiency using the Internet to locate information.
05.0 Demonstrate proficiency in using word processing software.
06.0 Demonstrate proficiency in using presentation software.
07.0 Demonstrate proficiency in using graphics software.
08.0 Demonstrate appropriate use of email.
09.0 Demonstrate knowledge of safety and privacy practices for online communication.
10.0 Develop and apply fundamental spreadsheet skills.
11.0 Develop and apply database skills.
12.0 Demonstrate skill in using video editing software and equipment.
13.0 Demonstrate proficiency in using audio editing software (e.g., Audacity).
14.0 Demonstrate proficiency locating, gathering, and preparing textual, graphical, and image-based web content.
15.0 Use Web 2.0 or Internet-based collaborative technology (e.g., Wikis, Wimba, Moodle, Edmodo, Facebook, Schoology, Gaggle) to facilitate a web development or research project.
16.0 Demonstrate an understanding of computer networks.
17.0 Demonstrate proficiency in web page development.
18.0 Demonstrate proficiency in game development.
19.0 Demonstrate proficiency in basic programming.

Career and Education Planning [these must be met to satisfy the requirements of Section 1003.4156, Florida Statutes]

20.0 Explain his or her career interests, skills and values.
21.0 Describe occupations and industries in his or her region.
22.0 Describe a variety of postsecondary pathways.
23.0 Create a personalized career and academic plan.

Florida Department of Education
Student Performance Standards

Course Title: **Information & Communications Technology (ICT) Essentials 1**
Course Number: **9009110**
Course Length: **Year**
Grade: **6-8**

Course Description:

This course introduces students to core concepts associated with computers and their use. The content includes hands-on opportunities to explore various software applications.

CTE Standards and Benchmarks	
01.0	Identify computer components and their functions. The student will be able to:
01.01	Describe what defines a computer and ways a computer can be used.
01.02	Identify the internal components of a computer (e.g., case, CPU, RAM, power supply, hard drive, motherboard, expansion cards, cabling).
01.03	Identify and know how to connect various computer input devices (e.g., mouse, keyboard, phone, camera, scanner, microphone, game controller, stylus, barcode reader finger print scanner, GPS device, touch pad, graphics tablet) and describe their use.
01.04	Identify and know how to connect various computer output devices (e.g., monitor, printer, projector, speakers, headphones) and describe their use.
01.05	Identify and know how to connect various storage devices (e.g., flash drive, external hard drive (SSD, network drive), memory card, discs, cloud).
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Compare and contrast various operating systems used in a computer and mobile devices (i.e., Windows, OS (Apple), UNIX, Android, iOS).
02.02	Describe and use conventional file naming conventions.
02.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
02.04	Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls).
02.05	Demonstrate proficiency in using gadgets, icons, and taskbars and other pre-loaded operating system programs. (e.g., calculator, text editor, clock, volume controls, adding icons and shortcuts to taskbar and shortcut menus).
03.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:

	03.01	Describe risks associated with social networking sites (e.g., FaceBook, Snapchat, Instagram, Twitter) and ways to reduce these risks.
	03.02	Define “privacy” and relate it to the term “digital footprint.”
	03.03	Practice cybersafety techniques to protect your personal information when using internet searches, email, chat rooms, and social network websites.
	03.04	Describe cyberbullying, its impact on perpetrators and victims and ways to respond.
	03.05	Describe risks associated with sexting (including legal issues, social consequences), and discuss methods for response, reporting, and prevention.
	03.06	Describe risks associated with online gaming, and identify ways to reduce these risks.
	03.07	Discuss issues related to downloading music or videos from the Internet, including unethical vs. illegal actions.
	03.08	Compare and contrast rules for copyright and fair use, especially in relation to using online resources for school and educational purposes.
	03.09	Distinguish between viruses and malware and discuss their impact on personal privacy and computer operation.
	03.10	Describe common threats used to spread malware and viruses, including phishing, pharming, Trojans, spyware, malicious sites, “free” downloads.
	03.11	Perform an antivirus scan on a computer system to check for viruses and malware.
	03.12	Describe strong password practices.
	03.13	Practice cyber safety techniques to protect your computer system when using Internet searches, email and social network websites.
	03.14	Identify security issues related to mobile phones, including personal information compromised if a phone is lost or stolen.
	03.15	Adhere to Acceptable Use Policies when accessing the Internet.
04.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:	
	04.01	Identify and use web terminology (WWW, Web Browser, Internet, Web Server, Web Page, Address Bar, Hyperlinks, Navigation Buttons, Search Bar, Bookmarks/Favorites, Tab, Downloading, Plug-ins, Social Media Plug-ins).
	04.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).
	04.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	04.04	Demonstrate proficiency using search engines, including Boolean search techniques.
	04.05	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF).
	04.06	Compare and contrast the roles of web servers and web browsers.

	04.07	Evaluate online information for relevance, credibility and quality using basic guidelines and indicators (e.g., authority, affiliation, purpose, bias, date).
	04.08	Identify and apply copyright and fair use guidelines, and explain plagiarism as an ethical and legal violation.
	04.09	Incorporate results from Internet searches into a research project (e.g., report, summary).
	04.10	Download images as needed to support a research project, complying with copyright notices.
	04.11	Properly cite Internet sources used to obtain information for a research project.
05.0	Demonstrate proficiency in using word processing software. The student will be able to:	
	05.01	Describe the general functions of word-processing software, including benefits for document creation, commonly used word-processing applications.
	05.02	Define the term “cloud computing,” and explain benefits of creating and storing word-processing documents online.
	05.03	List and describe common word processor interface tools and features.
	05.04	Identify common keyboard shortcuts used in word processors, and explain the benefits of using shortcuts.
	05.05	Format the page setup of a document, including margins, line spacing, indents, headers vs. footers, orientation.
	05.06	Explain printing options in a word processor, including shrink-to-fit, 2-sided printing, and document orientation.
	05.07	Copy, paste and move text within a document using mouse, menu and keyboard techniques.
	05.08	Copy, paste and move text among multiple documents using mouse, menu and keyboard techniques.
	05.09	Modify document view settings to display close-up, single and multiple pages.
	05.10	Define the term “format” as it relates to word processing.
	05.11	Format text using styles and font tools in a word processor.
	05.12	Format a document using multi-level heading styles to enable an outline view (e.g., document map, navigation pane) in a word processor.
	05.13	Create a table of contents using auto-generation tools and techniques in a word processor.
	05.14	Insert page breaks in a document.
	05.15	Create source citations and/or a bibliography in a document.
	05.16	Insert a current date and time stamp into a document.

05.17	Use word processor tools to determine the number of pages, words and characters in a document.
05.18	Use spell check, grammar check, thesaurus, and find and replace to edit a document.
05.19	Insert and modify sizing of images in a word-processing document.
05.20	Position an image relative to text in a document, using various text-wrapping options (inline, square, tight).
05.21	Use word-processing drawing tools to create pre-formatted shapes that enhance a document's content.
05.22	Use word-processor drawing tools to create a visual representation of information (e.g., SmartArt), such as diagram, flow chart.
05.23	Apply a column layout to text in a document as appropriate for the content (e.g., article, newsletter).
05.24	Apply simple numbered and bulleted lists in a document to make content easier to read and understand.
05.25	Format numbered and bulleted lists to produce multi-level outline in a document.
05.26	Create a simple brochure and/or flyer using a template.
05.27	Create a table in a word-processing document, and enter and move data in the table.
05.28	Convert a body of text into a table structure in a document to make content easier to read and understand.
05.29	Define "collaboration" and explain ways that users can collaborate on word-processing documents, including installed software vs. cloud-based software, real-time collaboration, auto save, sharing tools, revision history.
05.30	Use the translation tool in a word processor to translate text in a document from English into another language, and vice versa.
05.31	Add comments to a document when reviewing and/or editing content.
05.32	Revise a document using editing tools (e.g., Track Changes) in a word processor, and accept or reject changes as appropriate.
06.0	Demonstrate proficiency in using presentation software. The student will be able to:
06.01	Describe presentation software and the ways it can be used.
06.02	Create and/or modify a "slide master" or template to apply a consistent appearance to a presentation.
06.03	Add and format titles, subtitles and talking points in presentation slides.
06.04	Add slide numbers and/or date and time codes to presentation slides.
06.05	Insert and format images/graphics in presentation slides.
06.06	Insert new or duplicate slides in a presentation.

	06.07 Modify slide transitions in a presentation to include animation.
	06.08 Insert and/or modify sound settings and timing in a presentation.
	06.09 Modify the sequence of slides in a presentation.
	06.10 Produce a presentation that includes text, graphics and images, and present it.
	06.11 Modify a presentation's setup to repeat (i.e., loop) the presentation continuously.
07.0	Demonstrate proficiency in using graphics software. The student will be able to:
	07.01 Describe graphics software and the ways it can be used.
	07.02 Compare and contrast vector and raster images.
	07.03 Identify image file formats for photos and graphical art (e.g., TIFF, BMP, PSD, EPS, JPEG, GIF, PNG), and specify which formats are supported on the Web.
	07.04 Define terms related to the creation and display of graphical images (e.g., raster, vector, transparency, opacity, cropping, lasso, magic wand, marquee, canvas size, flattened, blur, dodge, sharpen, staking order, free transform, lossless, adjustments, move, clone, zoom, layers, filter, distort).
	07.05 Create images with effects using different tools, brushes, adjustments and filters available in graphics software.
	07.06 Copy and paste graphical images.
	07.07 Modify shapes and colors in a graphical image.
	07.08 Save and export a digital photograph in a format that provides the best image quality and file size for Internet use.
	07.09 Create a progressive slide presentation using graphical design/layout template features (e.g., SmartArt) and animated transitions.
	07.10 Use a portable digital video device (e.g., mobile phone, flip camera) or similar online tools to shoot video files, and transfer them to a computer.
	07.11 Use video-editing software to produce a slide show or movie.
	07.12 Create a multimedia presentation that incorporates edited video, animation, music and/or narration, and that applies principles of good design, smooth transitions and effective message delivery.
08.0	Demonstrate appropriate use of email. The student will be able to:
	08.01 Define "email "and describe the functions and advantages as a form of communication.
	08.02 Identify components of an email message.
	08.03 Explain the format of an email address (i.e., user name, @ symbol, domain).

08.04 Attach a file to an email message.
08.05 Reply to and forward an email message to one or more addressees.
08.06 Use the Internet to perform email activities (i.e., web-based email).
08.07 Identify the appropriate use of email and demonstrate related email etiquette.
08.08 Perform email organization and cleanup (e.g., trash, flags, create folders).

Florida Department of Education
Student Performance Standards

Course Title: **Information & Communications Technology (ICT) Essentials 2**
Course Number: **9009120**
Course Length: **Year**
Grade: **6-8**

Course Description:

This course builds on the previous course and provides greater depth and more complex concepts and the skills/knowledge to master these concepts. Students will be provided opportunities to extend their skills with various software applications by creating more complex documents and using more complex functions.

CTE Standards and Benchmarks	
09.0	Demonstrate knowledge of safety and privacy practices for online communication. The student will be able to:
09.01	Define “privacy” and relate it to the term “digital footprint.”
09.02	Describe the risks of communicating on social networking sites (e.g. Facebook, Twitter, Instagram) and identify ways to communicate safely.
09.03	Distinguish between copyright infringement, plagiarism and fair use in an educational setting and in relation to school projects, especially with music and pictures.
09.04	Describe online communication practices that contribute to cyberbullying.
09.05	Practice safe online communication techniques with Internet searches, email, chat rooms, and other social network websites.
09.06	Follow an Acceptable Use Policy (AUP) when accessing the Internet.
10.0	Develop and apply fundamental spreadsheet skills. The student will be able to:
10.01	Define “spreadsheet” and describe ways it may be used.
10.02	Identify the parts of the spreadsheet display, including cells, columns and rows, cell references, cell range.
10.03	Create and navigate through multiple spreadsheets in a file.
10.04	Insert and format various types of data (text, numeric, date/time) in a spreadsheet cells.
10.05	Select multiple cells, including adjacent and non-adjacent ranges, using mouse and keyboard techniques.

CTE Standards and Benchmarks	
10.06	Cut, copy, and paste information from one or more cells to another part of the spreadsheet.
10.07	Use the undo and redo tools in a spreadsheet.
10.08	Apply and modify cell formatting for currency, date and percentage values.
10.09	Resize column width and row height in a spreadsheet.
10.10	Insert and delete columns and rows in a spreadsheet.
10.11	Merge and unmerge cells in a spreadsheet.
10.12	Apply shading and borders to a spreadsheet.
10.13	Describe the purpose of a table and how it relates to a spreadsheet.
10.14	Create and print a table and/or range that displays and sums the values of different data types.
10.15	Identify various types of charts (e.g., line, bar, pie, scatter) and common chart components (e.g., vertical axis, horizontal axis, legend), and explain when to use each chart type.
10.16	Create a chart from existing data and format the pieces (data set), change the background color, and add appropriate titles and a legend.
10.17	Use the auto sum function to calculate the values of multiple cells.
10.18	Insert common functions (SUM, AVERAGE, COUNT, MAX, MIN) and simple mathematical formulas which include addition, subtraction, multiplication, or division into a spreadsheet.
10.19	Distinguish between absolute and relative cell references in a spreadsheet.
10.20	Use the sort function to organize information numerically or alphabetically, including multiple levels of sorting.
10.21	Use the filter function to display spreadsheet data based on specific criteria.
10.22	Use conditional formatting to highlight text in a spreadsheet.
11.0	Develop and apply database skills. The student will be able to:
11.01	Define database and describe real-world uses (e.g., search engines, schools, drivers licenses and car registrations, hospitals, retail, law enforcement).
11.02	Distinguish between databases and spreadsheets.
11.03	Identify advantages of using a database instead of alternatives (e.g., spreadsheets, electronic documents, paper).

CTE Standards and Benchmarks
11.04 Define “Big Data” and describe how it is used in advertising.
11.05 Identify the components of a database.
11.06 Distinguish between fields and records in a database.
11.07 Describe the basic data types and formats used in a database.
11.08 Distinguish between a table and a query.
11.09 Identify database keys, including primary and foreign.
11.10 Identify the relationships between tables in databases (i.e., one-to-one, one-to-many, many-to-many).
11.11 Distinguish between a query and a report.
11.12 Identify various report types.
11.13 Describe Structured Query Language (SQL) and discuss its use with databases.
11.14 Identify and compare various database applications, including Microsoft Access, MySQL, Oracle.
11.15 Create a database table that uses multiple data types.
11.16 Add, Edit, and Delete records from a database table.
11.17 Sort records in a database query or table.
11.18 Troubleshoot common database errors, including data type errors, query syntax errors.
11.19 Create a basic select query in one table.
11.20 Create an action query to manipulate data.
11.21 Create a query using primary and foreign keys.
11.22 Create a simple table join.
11.23 Import and export data from a database into a spreadsheet.
11.24 Create relevant reports from a database.
12.0 Demonstrate skill in using video editing software and equipment. The student will be able to:

CTE Standards and Benchmarks	
	12.01 Demonstrate ability to operate a video camera (e.g., Flip camera, cell phone).
	12.02 Write storyboards to depict a one minute video segment.
	12.03 Determine appropriate lighting needs.
	12.04 Create video shots sufficient to produce a one minute video.
	12.05 Identify the functions and benefits of the digital video software interface.
	12.06 Demonstrate ability to edit, cut, erase, and insert video.
	12.07 Edit video as needed to achieve desired message and length.
	12.08 Describe a first complete run-through of the video production process.
	12.09 Characterize the qualities of effective communication in a completed video.
	12.10 Upload finished video files to a website.
13.0	Demonstrate proficiency in using audio editing software (e.g., Audacity). The student will be able to:
	13.01 Identify the functions and benefits of the audio editing software interface.
	13.02 Demonstrate ability to edit, cut, erase, and insert audio.
	13.03 Edit audio as needed to achieve desired message and length.
	13.04 Prepare a 30 second to 1 minute audio commercial project.
14.0	Demonstrate proficiency locating, gathering, and preparing textual, graphical, and image-based web content. The student will be able to:
	14.01 Define the elements of a webpage and what makes a good webpage.
	14.02 Describe effective text and image content for webpages based on how visitors use the Web.
	14.03 List guidelines and conventions for effective text on webpage.
	14.04 Explain the inverted pyramid model of newspaper journalism and how it applies to Web content.
	14.05 Use word-processing software to create effective written content for a webpage.
	14.06 Create and/or edit message-driven image content for a webpage using graphics software.

CTE Standards and Benchmarks	
14.07	Access graphics through various recourses (e.g., scanner, digital camera, CD-ROM, clipart, copyright-free online graphics).
14.08	Plan the content and design of a basic webpage using strategies for effective Web communication, including brainstorming, determining audience, choosing content and media types, using white space.

Florida Department of Education
Student Performance Standards

Course Title: **Information & Communications Technology (ICT) Essentials Careers and Career Planning**
Course Number: **9009140**
Course Length: **Year**
Grade: **6-8**

Course Description:

This course builds on the previous two courses and provides greater depth and more complex concepts and the skills/knowledge to master these concepts. In addition to working with network concepts, students will be provided opportunities to further extend their skills with various software applications by creating more complex documents and using more complex functions and technologies. Students will continue their exposure to computer programming and the creation of more complex computer programs. For the programming instruction, the use of Alice from Carnegie Mellon University is encouraged as it is a highly engaging program, includes instructional materials, and is available at no cost.

CTE Standards and Benchmarks	
15.0	Use Web 2.0 or Internet-based collaborative technology (e.g., Wikis, Wimba, Moodle, Edmodo, Facebook, Schoology, Gaggle) to facilitate a web development or research project. The student will be able to:
15.01	Create and use a collaborative environment for communicating and sharing among project team members.
15.02	Create and use a social media page (e.g., Wikis, Wimba, Moodle, Edmodo, Facebook, Schoology, Gaggle) to share and publish project components (e.g., content, images, graphics, videos) for gauging visitor reaction and obtaining feedback.
16.0	Demonstrate an understanding of computer networks. The student will be able to:
16.01	Define “network” and give examples of networks used at home, school, and work.
16.02	Compare types of networks, including LAN, WAN, MAN, VPN, intranet, extranet, the Internet.
16.03	Compare common network topologies, including bus, star, ring, mesh.
16.04	Compare various network models and their advantages, including client/server, mainframe/terminal, peer-to-peer.
16.05	Compare various methods and media for network connections, including broadband, wireless, Bluetooth, cellular, satellite.
16.06	Describe the functions of various network hardware devices, including NIC, hub, switch, router, bridge, gateway, access point.
16.07	Describe the purpose of protocols, and identify the protocols commonly used in networks, including TCP/IP, DHCP, DNS, HTTP, FTP, IMAP, POP, SMTP.
16.08	Describe the purpose and function of IP addressing and distinguish between public and private IP addresses.

CTE Standards and Benchmarks	
16.09	Describe the OSI reference model and its layers, including tracing the flow of data between two network nodes through the OSI layers.
17.0	Demonstrate proficiency in webpage development. The student will be able to:
17.01	Identify website domains, and relate a site's domain to its purpose.
17.02	Relate basic components of a webpage (e.g. color, space, written content, typography, images, links, multimedia) to aesthetic, functional and/or usable design principals.
17.03	Define aesthetic design, and explain how aesthetics can affect a visitors' perception of a website's information.
17.04	Demonstrate knowledge of color wheel concepts and effective use of color on a website.
17.05	Compare functional and usable design principles, and explain how usability can affect a website's success.
17.06	Critique the aesthetic design, usability and accessibility of sample websites.
17.07	Define multimedia, and identify its role in webpage interactivity.
17.08	Explain the primary steps of the website planning process.
17.09	Apply the website planning process to plan the design for basic website.
17.10	Build the site navigation scheme for a website.
17.11	Compare webpage creation using an HTML text editor to using a graphical user interface (GUI) editor.
17.12	Compare website creation using an online site builder, an offline site builder and a content management system (CMS).
17.13	Modify an existing webpage template to create an effective look and feel for a website.
17.14	Create a website using a template.
17.15	Define "HTML (Hypertext Markup Language)" and related terms, including tag vs. element, container vs. empty tag, block-level vs. inline element, attribute value, semantic tag.
17.16	Identify HTML elements required to create webpage structure.
17.17	Create webpages using basic HTML tags (e.g., headings, lists, character styles, text alignment, tables, comments).
17.18	Use HTML to create hyperlinks to external sites.
17.19	Use HTML to insert common image file formats into webpages, and use an image as a hyperlink.

CTE Standards and Benchmarks	
	17.20 Explain Cascading Style Sheet (CSS) technology.
	17.21 Apply CSS styles to an HTML page.
	17.22 Create and/or edit animation files, and integrate them into a webpage.
	17.23 Create and/or edit video files, and integrate them into a webpage.
	17.24 Use Dynamic HTML (DHTML) to enhance webpage interactivity.
	17.25 Create and use a wiki or similar tool for collaborating among project team members.
	17.26 Create and use a social media page (e.g., Facebook, Wimba, Edmodo) and/or a blog to share content and collaborate on projects.
	17.27 Review webpage content, verify copyright restrictions, and create meta-data before publishing a site to the internet.
	17.28 Test webpages for display, functionality, and accessibility before publishing a site to the Internet.
	17.29 Validate webpage code using W3C validation tools before publishing a site to the Internet.
	17.30 Describe network issues relating to websites, including bandwidth, compression, streaming, web hosting.
	17.31 Explain the purpose of File Transfer Protocol (FTP) in accessing information on the Internet.
	17.32 Publish a website using FTP.
	17.33 Describe website security methods, including secure server vs. unsecured served, SSL, SSH, encryption.
18.0	Demonstrate proficiency in game development. The student will be able to:
	18.01 Describe the role of games in modern society (e.g., education, task training, social networking, therapy, recreation).
	18.02 Identify various types of games (e.g., chance, skill, knowledge, role-playing, and storytelling).
	18.03 Identify the steps of the design process for creating a game.
	18.04 Apply the design process to solving a problem.
	18.05 Analyze (deconstruct) existing games.
	18.06 Identify the tools and skills needed for creating games.
	18.07 Identify design criteria and constraints.

CTE Standards and Benchmarks	
18.08	Create storyboards to model a game's program flow and functionality.
18.09	Identify the programmer's role in creating games.
18.10	Identify common programming languages and applications used to create computer games.
18.11	Compare sequential, iteration (loop) and selection programming structures.
18.12	Define the term algorithm (i.e., a set of repeatable steps) and how it applies to problem solving.
18.13	Create an algorithm to solve a problem or complete a task.
18.14	Use pseudo-code to model a game program's flow.
18.15	Define logic errors and identify them in a game program or model.
18.16	Explain the types and uses of variables in game programming.
18.17	Describe basic Boolean concepts, including logical operators, order of precedence, expressions.
18.18	Describe the use of events, event handlers and functions in game programming.
18.19	Describe the use of parameters and arguments in game programming.
18.20	Describe the use of objects, classes and instances in game programming.
18.21	Describe the use of properties and methods with objects in game programming.
18.22	Write appropriate code to create a simple game using structured programming.
18.23	Test and evaluate the game program you created.
18.24	Modify the game program as needed to solve a problem.
18.25	Create an animated object (i.e., sprite) to be used in a game program.
18.26	Use programming code to control the behavior of an animated object (i.e., sprite) in a game program.
19.0	Demonstrate proficiency in basic programming. The student will be able to:
19.01	Define "programming" and discuss its role in computing.
19.02	Explain the binary representation of data and programs in computers.

CTE Standards and Benchmarks	
19.03	Distinguish among the three types of programming languages (machine, assembly, high-level), and give examples.
19.04	Compare and contrast languages that are usually compiled (e.g., C++, Java) and interpreted (e.g., JavaScript, Python).
19.05	Describe the structure of a simple program, and explain why sequencing is important.
19.06	Write a program design document using pseudo-code that shows program flow.
19.07	Explain strategies used in problem-solving, and relate them to computer programming.
19.08	Define the term “algorithm,” and explain how it relates to problem-solving.
19.09	Explain the three types of programming errors (i.e., logic, syntax, runtime), and describe the forms of testing that can be used to locate and debug errors.
19.10	Solve a problem using logic by planning a strategy, designing and testing a hypothesis, and/or creating a set of step-by-step instructions to perform a task.
19.11	Define “structured programming” and discuss the advantages of this approach.
19.12	Define the three main programming control structures used in structured programming: sequential, selection (decision), and iteration (loops).
19.13	Describe iterative programming structures (e.g., while, do/while) and how they are used in programming.
19.14	Describe selection programming structures (e.g., if/then, else) and explain the logic used for if statements.
19.15	Write a simple program in pseudo-code that uses structured programming to solve a problem.
19.16	Explain the types and uses of variables in programming.
19.17	Explain basic object-oriented concepts.
19.18	Describe fundamental Boolean concepts, including Boolean algebra, operators, logic.
19.19	Create animated objects using a high-level programming environment (e.g., Alice, Greenfoot) to control their behavior.
19.20	Create a simple program that uses animated objects.
19.21	Convert a simple program from pseudo-code into a common high-level programming environment (e.g. Alice, Greenfoot).
19.22	Troubleshoot and debug errors in code.

Career and Education Planning [these must be met to satisfy the requirements of Section 1003.4156, Florida Statutes]	
Standards and Benchmarks	
20.0	Explain his or her career interests, skills and values. The student will be able to:
20.01	Describe his or her career interests based on a career interest assessment, personal experience, career informational interviews, research and/or reflection.
20.02	Describe what career-related skills are his or her current strengths or could become strengths in the future with practice and training based on a career skill assessment, personal experience and/or reflection.
20.03	Describe what lifestyle and workplace values are most important to them to consider during career decision making, such as salary and benefits, work environment, the nature of the work and work/life balance.
20.04	Describe what values that relate to positively impacting others and the world are most important to them to weigh during career decision making.
21.0	Describe occupations and industries in his or her region. The student will be able to:
21.01	Define Career Clusters, industries and occupations.
21.02	Define regional poverty, average and family-sustaining wage thresholds.
21.03	Review local labor market data to identify the top five regional occupations as relates to each of the following: employment, growth and salary.
21.04	List three occupations that align with his or her personal career interests, skills and values.
21.05	List the regional salary, employment and growth of three occupations they are most interested in learning more about.
21.06	Summarize occupational content learned through a career informational interview, career fair, job shadowing, service learning, guest speaker, project-based learning, work-based learning, worksite visit or other firsthand experience.
22.0	Describe a variety of postsecondary pathways. The student will be able to:
22.01	Evaluate the pros and cons of pursuing education, employment, entrepreneurship or enlistment immediately following high school.
22.02	Define postsecondary training provider options and their admissions requirements, including apprenticeships, technical colleges, state or community colleges, universities and industry-recognized certification providers.
22.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees
22.04	Explain training options aligned with his or her career assessment results and occupational exploration.
22.05	Review postsecondary training data and list the total cost, average debt after graduation and median earnings and job placement rates of students who completed the student's preferred postsecondary training option.
22.06	Summarize what they learned about his or her preferred postsecondary training provider through online research; virtual or in-person tours; a college fair; and/or interviewing a current student, alumni or staff member.
23.0	Create a personalized career and academic plan. The student will be able to:
23.01	Prioritize an occupation for plan formation using one or more decision making techniques, such as a decision matrix, pros and cons analysis or other means

23.02	Explain the reasoning for choosing to pursue his or her preferred occupation
23.03	Identify which credentials, technical skills, and employability or entrepreneurship skills are relevant to his or her preferred career pathway.
23.04	Prioritize a recognized postsecondary credential (industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees) aligned with his or her chosen occupation using a decision-making technique, such as a decision matrix and/or pros and cons analysis, etc.
23.05	Prioritize a postsecondary training provider aligned with his or her recognized postsecondary credential goal using a decision-making technique, such as a decision matrix and/or pros and cons analysis, etc.
23.06	Define means of paying for postsecondary training, including scholarships (must include State scholarships), grants, savings, work, work-study programs, private loans and Federal loans.
23.07	Describe ways of meeting the requirements of Florida's graduation pathways and obtaining accelerated credit, work-based learning experience, career and technical education credit and industry-recognized certifications in high school.
23.08	Develop a freshman year course schedule that meets high school graduation requirements and that provides academic and career preparation aligned with the student's career goals.
23.09	Identify extracurricular activities aligned with his or her occupational and postsecondary training goals.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org

Career Planning

Effective July 1, 2019, per Section 1003.4156, Florida Statutes (F.S.), for students to meet middle grades promotion requirements, a Career and Education Planning course must be completed in either sixth, seventh, or eighth grade. These courses should be taught integrating the eight career and education planning course standards.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional

methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Fundamentals of Networking and Information Support**
Course Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Course Number	9009400
CIP Number	149009400M
Grade Level	6-8
Course Length	Year
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Information Technology career cluster. The content includes but is not limited to foundational knowledge and skills related to computer networks and information support structure in the information technology industry.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Course Structure

The length of this course is one semester. It may be offered for two semesters when appropriate. When offered for one semester, it is recommended that it be at the exploratory level and more in-depth when offered for two semesters.

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9009400	Fundamentals of Networking and Information Support	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G CYBER TECH 7G	Year

Standards

After successfully completing this course, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate comprehension and communication skills.
03.0 Use technology to enhance the effectiveness of communication skills.
04.0 Demonstrate an understanding of Internet safety and ethics.
05.0 Perform e-mail activities.
06.0 Demonstrate knowledge of different operating systems.
07.0 Demonstrate proficiency navigating the Internet and the intranet.
08.0 Develop an awareness of microprocessors and digital computers.
09.0 Demonstrate an understanding of the Open Systems Interface (OSI) model.
10.0 Identify computer components and their functions.
11.0 Demonstrate proficiency using computer networks.
12.0 Demonstrate an understanding of database design, structure, and operation.
13.0 Demonstrate a fundamental understanding of Structured Query Language (SQL).

Florida Department of Education
Student Performance Standards

Course Title: **Fundamentals of Networking and Information Support**
Course Number: **9009400**
Course Length: **Year**

Course Description:

This course provides students with opportunities to acquire foundational knowledge and skills suitable for pursuing higher level programs of study related to the information technology industry.

CTE Standards and Benchmarks	
01.0	Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. The student will be able to:
01.01	Develop keyboarding skills to enter and manipulate text and data.
01.02	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
01.03	Identify and describe communications and networking systems used in workplace environments.
01.04	Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software.
01.05	Describe ethical issues and problems associated with computers and information systems.
02.0	Demonstrate comprehension and communication skills. The student will be able to:
02.01	Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively.
02.02	Organize ideas and communicate oral and written messages appropriate for information technology environments.
02.03	Collaborate with individuals and teams to complete tasks and solve information technology problems.
02.04	Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration).
03.0	Use technology to enhance the effectiveness of communication skills. The student will be able to:
03.01	Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.
03.02	Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve problems and complete tasks.

CTE Standards and Benchmarks	
04.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:
04.01	Describe cyber-bullying and its impact on perpetrators and victims.
04.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.
04.03	Describe risks associated with sexting, including related legal issues, social engineering aspects, prevention methods, and reporting of offenses.
04.04	Describe the risks associated with online gaming and ways to mitigate these risks.
04.05	Describe the ethics and copyright legalities of downloading music or videos from the Internet.
04.06	Describe risks associated with social networking sites (e.g., FaceBook, MySpace, Twitter) and ways to mitigate these risks.
04.07	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.
05.0	Perform email activities. The student will be able to:
05.01	Describe email capabilities and functions.
05.02	Identify components of an email message.
05.03	Identify the components of an email address.
05.04	Identify when to use different email options.
05.05	Attach a file to an email message.
05.06	Forward an email message.
05.07	Use an address book.
05.08	Reply to an email message.
05.09	Use the Internet to perform email activities.
05.10	Identify the appropriate use of email and demonstrate related email etiquette.
05.11	Identify when to include information from an original email message in a response.

CTE Standards and Benchmarks	
	05.12 Identify common problems associated with widespread use of email.
06.0	Demonstrate knowledge of different operating systems. The student will be able to:
	06.01 Identify operating system file naming conventions.
	06.02 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	06.03 Demonstrate a working knowledge of standard file formats.
	06.04 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, Linux).
07.0	Demonstrate proficiency navigating the Internet and the intranet. The student will be able to:
	07.01 Identify and describe Web terminology.
	07.02 Demonstrate proficiency in using the basic features of GUI browsers (e.g., setting bookmarks, basic configurations, email configurations, address book).
	07.03 Define Universal Resource Locators (URLs) and associated protocols (e.g., .com, .org, .edu, .gov, .net, .mil).
	07.04 Demonstrate proficiency using search engines (e.g., Yahoo!, Google).
	07.05 Demonstrate proficiency downloading files.
	07.06 Identify effective Boolean search strategies.
08.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
	08.01 Describe the evolution of the digital computer.
	08.02 Explain the general architecture of a microcomputer system.
	08.03 Explain the evolution of microprocessors.
	08.04 Explain software hierarchy and its impact on microprocessors.
	08.05 Explain the need for and use of peripherals.
	08.06 Demonstrate proficiency using peripherals.

CTE Standards and Benchmarks	
	08.07 Identify the basic concepts of computer maintenance and upgrades.
	08.08 Differentiate between diagnosing and troubleshooting.
09.0	Demonstrate an understanding of the Open Systems Interface (OSI) model. The student will be able to:
	09.01 Describe the evolution of OSI from its inception to the present and into the future.
	09.02 Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.
	09.03 Describe the purpose of the OSI model and each of its layers.
	09.04 Explain specific functions belonging to each OSI model layer.
	09.05 Understand how two network nodes communicate through the OSI model.
	09.06 Discuss the structure and purpose of data packets and frames.
	09.07 Describe the two types of addressing covered by the OSI model.
10.0	Identify computer components and their functions. The student will be able to:
	10.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	10.02 Use common computer and programming terminology.
11.0	Demonstrate proficiency using computer networks. The student will be able to:
	11.01 Define networking and describe the purpose of a network.
	11.02 Describe the conceptual background of digital networks including terminology and basics.
	11.03 Describe various types of networks and the advantages and disadvantages of each (e.g., peer to peer, client/server, mainframe/terminal).
	11.04 Describe the use, advantages, and disadvantages of various network media (e.g., thinnet cable, coaxial), twisted pair (cat 5), fiber optics).
	11.05 Describe the function of various network devices (e.g., hub, switched hub or switch, router bridge, gateway, access points).
	11.06 Describe how network devices are identified (i.e., IP addressing).

CTE Standards and Benchmarks	
	11.07 Explain the protocols commonly used in a network environment.
	11.08 Differentiate between public and private IP addresses.
	11.09 Describe the common ports and corresponding protocols used in a network.
	11.10 Describe the difference between the Internet and intranet.
	11.11 Discuss the differences between Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), and Virtual Private Network (VPN).
12.0	Demonstrate an understanding of database design, structure, and operation. The student will be able to:
	12.01 Describe a relational database and its key elements.
	12.02 Describe the Entity Relationship Model (ERM).
	12.03 Differentiate between one-to-many, many-to-many and one-to-one relationships.
	12.04 Define referential integrity and describe its importance to managing information.
13.0	Demonstrate a fundamental understanding of Structured Query Language (SQL). The student will be able to:
	13.01 List the capabilities of SQL SELECT statements.
	13.02 Execute basic SQL statements, including SELECT, INSERT, and UPDATE.
	13.03 Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
	13.04 Use the AS clause to define column aliases to rename columns in the query result.
	13.05 Use SQL to display the structure of a table.
	13.06 Apply SQL syntax to restrict the rows returned from a query.
	13.07 Demonstrate application of the WHERE clause syntax.
	13.08 Apply the proper comparison operator to return a desired result.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Fundamentals of Web and Software Development**
Course Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Course Number	9009500
CIP Number	149009500M
Grade Level	6-8
Course Length	Year
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this course is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Information Technology career cluster. The content includes but is not limited to foundational knowledge and skills related to web and software development in the information technology industry.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Course Structure

To teach the course listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9009500	Fundamentals of Web and Software Development	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G COMP PROG 7G	Year

Standards

After successfully completing this course, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate comprehension and communication skills.
03.0 Use technology to enhance the effectiveness of communication skills.
04.0 Demonstrate an understanding of Internet safety and ethics.
05.0 Perform e-mail activities.
06.0 Demonstrate knowledge of different operating systems.
07.0 Demonstrate proficiency navigating the Internet and the intranet.
08.0 Demonstrate proficiency using HTML commands.
09.0 Demonstrate proficiency in webpage design.
10.0 Demonstrate proficiency using specialized web design software.
11.0 Develop an awareness of programming languages.
12.0 Demonstrate proficiency using common software applications.

Florida Department of Education
Student Performance Standards

Course Title: **Fundamentals of Web and Software Development**
Course Number: **9009500**
Course Length: **Year**

Course Description:

This course provides students with opportunities to acquire foundational knowledge and skills suitable for pursuing higher level programs of study related to the information technology industry.

CTE Standards and Benchmarks	
01.0	Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. The student will be able to:
01.01	Develop keyboarding skills to enter and manipulate text and data.
01.02	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
01.03	Identify and describe communications and networking systems used in workplace environments.
01.04	Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software.
01.05	Describe ethical issues and problems associated with computers and information systems.
02.0	Demonstrate comprehension and communication. The student will be able to:
02.01	Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively.
02.02	Organize ideas and communicate oral and written messages appropriate for information technology environments.
02.03	Collaborate with individuals and teams to complete tasks and solve information technology problems.
02.04	Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration).
03.0	Use technology to enhance the effectiveness of communication skills. The student will be able to:
03.01	Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.
03.02	Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, email, voice mail) to solve problems and complete tasks.

CTE Standards and Benchmarks	
04.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:
04.01	Describe cyber-bullying and its impact on perpetrators and victims.
04.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.
04.03	Describe risks associated with sexting, including related legal issues, social engineering aspects, prevention methods, and reporting of offenses.
04.04	Describe the risks associated with online gaming and ways to mitigate these risks.
04.05	Describe the ethics and copyright legalities of downloading music or videos from the Internet.
04.06	Describe risks associated with social networking sites (e.g., FaceBook, MySpace, Twitter) and ways to mitigate these risks.
04.07	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.
05.0	Perform email activities. The student will be able to:
05.01	Describe email capabilities and functions.
05.02	Identify components of an email message.
05.03	Identify the components of an email address.
05.04	Identify when to use different email options.
05.05	Attach a file to an email message.
05.06	Forward an email message.
05.07	Use an address book.
05.08	Reply to an email message.
05.09	Use the Internet to perform email activities.
05.10	Identify the appropriate use of email and demonstrate related email etiquette.
05.11	Identify when to include information from an original email message in a response.
05.12	Identify common problems associated with widespread use of email.
06.0	Demonstrate knowledge of different operating systems. The student will be able to:
06.01	Identify operating system file naming conventions.
06.02	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).

CTE Standards and Benchmarks	
	06.03 Demonstrate a working knowledge of standard file formats.
	06.04 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, Linux).
07.0	Demonstrate proficiency navigating the Internet and the intranet. The student will be able to:
	07.01 Identify and describe Web terminology.
	07.02 Demonstrate proficiency in using the basic features of GUI browsers (e.g., setting bookmarks, basic configurations, email configurations, address book).
	07.03 Define Universal Resource Locators (URLs) and associated protocols (e.g., .com, .org, .edu, .gov, .net, .mil).
	07.04 Demonstrate proficiency using search engines (e.g., Yahoo!, Google).
	07.05 Demonstrate proficiency downloading files.
	07.06 Identify effective Boolean search strategies.
08.0	Demonstrate proficiency using HTML commands. The student will be able to:
	08.01 Identify elements of a Web page.
	08.02 Define basic HTML terminology.
	08.03 Analyze HTML source code developed by others.
	08.04 Create Web pages using basic HTML tags (e.g., links, lists, character styles, text alignment, tables).
	08.05 Edit and test HTML documents for accuracy and validity.
	08.06 Create a website using basic functions of a WYSIWYG or GUI editor.
	08.07 Use basic functions of HTML, DHTML, and XML editors and converters.
	08.08 Enhance web pages through the addition of images and graphics including animation.
09.0	Demonstrate proficiency in webpage design. The student will be able to:
	09.01 Demonstrate an understanding of acceptable webpage design.
	09.02 Design a website using storyboarding techniques.
	09.03 Describe and apply color theory as it applies to webpage design (e.g., background and text color).

CTE Standards and Benchmarks	
	09.04 Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD-ROMs).
	09.05 Use image design software to create and edit images.
	09.06 Demonstrate proficiency in publishing to the Internet.
10.0	Demonstrate proficiency using specialized web design software. The student will be able to:
	10.01 Compare and contrast various specialized web design software (e.g., Dreamweaver, Flash).
	10.02 Demonstrate proficiency using various specialized web design software (e.g., Dreamweaver, Flash).
11.0	Develop an awareness of programming languages. The student will be able to:
	11.01 Explain the history of programming languages.
	11.02 Explain the need for and use of compilers.
	11.03 Explain how compilers work.
	11.04 Identify the three types of programming design approaches (e.g., top-down, structured, object-oriented).
	11.05 Compare the various types or classes of programming languages (e.g., compiled, interpretive).
	11.06 Differentiate among source code, machine code, interpreters, and compilers.
	11.07 Characterize the major categories of programming languages and how they are used.
	11.08 Create a model flowchart for a computer program.
	11.09 Describe the stages in the software development life cycle.
12.0	Demonstrate proficiency using common software applications. The student will be able to:
	12.01 Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database).
	12.02 Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Course Title: **Digital Discoveries in Society**
Course Type: **Orientation/Exploratory**
Career Cluster: **Information Technology**

Secondary – Middle School	
Program Number	9009600
CIP Number	0511020111
Grade Level	6-8
Course Length	Year
Teacher Certification	Refer to the **Course Structure** section.
CTSO	FBLA, BPA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

Digital Discoveries in Society is an introductory computer science course that empowers students to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. In addition to fundamental computer information, the content includes but is not limited to digital technologies associated with problem solving, computer components, internet safety and ethics, web development, animations and games, basic programming techniques, and physical computing. The first six units in the course encourages students to see where computer science exists around them and how they can engage with it as a tool for exploration and expression. Units seven and eight encourage the students to look outward and explore the impact of computer science on society.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Course Structure

This course is a planned year long course.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the course structure:

Course Number	Course Title	Teacher Certification	Length
9009600	Digital Discoveries in Society	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G	Year

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of the problem solving process.
02.0 Identify computer components and their functions.
03.0 Demonstrate an understanding of internet safety and ethics.
04.0 Demonstrate proficiency using the Internet to locate information.
05.0 Demonstrate proficiency in web page development.
06.0 Demonstrate proficiency in animation and games.
07.0 Demonstrate proficiency in basic programming.
08.0 Demonstrate proficiency in physical computing with hardware devices.

Florida Department of Education
Student Performance Standards

Course Title: **Digital Discoveries in Society**
Course Number: **9009600**
Course Length: **Year**
Grade: **6-8**

Course Description:

Digital Discoveries in Society is an introductory computer science course that empowers students to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. In addition to fundamental computer information, the content includes but is not limited to digital technologies associated with problem solving, computer components, internet safety and ethics, web development, animations and games, basic programming techniques, and physical computing. The first six units in the course encourages students to see where computer science exists around them and how they can engage with it as a tool for exploration and expression. Units seven and eight encourage the students to look outward and explore the impact of computer science on society.

This course may be used with free online coding tools from Scratch.mit.edu, Code.org, Microsoft Makecode, CSfirst.withgoogle.com, CodeAcademy, Khan Academy, Code Combat, Lightbot, Pixlr, etc.

For the last unit on physical computing it is recommended that students have access to one of the following to work on in pairs or in small groups: Circuit Playgrounds, Micro:bits, Raspberry Pi's, Arduino boards, etc.

CTE Standards and Benchmarks	
01.0	Demonstrate and understanding of the problem solving process. The student will be able to:
01.01	Identify and explain the four parts of the problem solving process (Define, Prepare, Try, and Reflect).
01.02	Describe the strategies and processes to become a more effective problem solver.
01.03	Explain how computers help people to solve problems.
01.04	Compare and contrast how people and computers approach problems differently.
01.05	Explain what a computer needs from people in order to solve problems effectively.
02.0	Identify computer components and their functions. The student will be able to:
02.01	Define "computer," and explain why it is important to have a basic understanding of how computers work.
02.02	Describe the four functions of the computing cycle (i.e., input, processing, output, storage).

	02.03	Identify the internal components of a computer (e.g., case, CPU, RAM, ROM, power supply, hard drive, motherboard, expansion cards, cabling).
	02.04	Identify and know how to connect various computer input devices (e.g., mouse, keyboard, phone, camera, scanner, microphone, game controller, stylus, barcode reader, finger print scanner, GPS device, touch pad, graphics tablet) and describe their use.
	02.05	Identify and know how to connect various computer output devices (e.g., monitor, printer, projector, speakers, and headphones) and describe their use.
	02.06	Identify and know how to connect various storage devices (e.g., flash drive, external hard drive (SSD, network drive), memory card, discs, and cloud).
	02.07	Identify various computer connection ports, including USB, FireWire, parallel, serial, Ethernet (RJ-45), RJ-11, HDMI, audio.
	02.08	Illustrate and correctly label the parts of a computer system.
	02.09	Describe how people use computers at home, school and work.
	02.10	Define the term "cloud storage" and explain the advantages and disadvantages of using cloud storage.
03.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:	
	03.01	Describe strong password practices and explain why such practices are needed at school, home and work.
	03.02	Define “privacy” and relate it to the term “digital footprint.”
	03.03	Practice cyber safety techniques to protect your personal information when using internet searches, email, chat rooms, and social network websites.
	03.04	Describe cyberbullying, its impact on perpetrators and victims and ways to respond.
	03.05	Describe risks associated with online gaming, and identify ways to reduce these risks.
	03.06	Discuss issues related to downloading music, videos, or images from the Internet, including unethical vs. illegal actions.
	03.07	Compare and contrast rules for copyright and fair use, especially in relation to using online resources for school and educational purposes.
	03.08	Properly cite sources used for images and information obtained from the internet for projects and research
	03.09	Review your district/school Acceptable Use Policies when accessing the Internet and adhere to the AUP while using school equipment, internet and software.
04.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:	
	04.01	Identify and use web terminology (WWW, Web Browser, Internet, Web Server, Web Page, Address Bar, Hyperlinks, Navigation Buttons, Search Bar, Bookmarks/Favorites, Tab, Downloading, Plug-ins, and Social Media Plug-ins).
	04.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, https, ftp, telnet, mailto).

	04.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	04.04	Demonstrate proficiency using search engines, including Boolean and other advanced search techniques.
	04.05	Demonstrate proficiency in uploading and downloading files, images, documents and music for class projects and collaboration.
	04.06	Compare and contrast the roles of web browsers and search engines.
	04.07	Evaluate online information for relevance, credibility and quality using basic guidelines and indicators (e.g. authority, affiliation, purpose, bias, date).
	04.08	Distinguish between copyright infringement, plagiarism and fair use in an educational setting and in relation to school projects, especially with music and pictures.
	04.09	Identify and apply copyright and fair use guidelines, and explain plagiarism as an ethical and legal violation.
	04.10	Incorporate results from Internet searches into a research project (e.g., report, summary, website design, app creation, etc.).
	04.11	Download images as needed to support a research project, complying with copyright notices.
	04.12	Properly cite internet sources used to obtain information for a research project.
	04.13	Explain what creative commons licensing is and why it is important to web designers and programmers.
05.0	Demonstrate proficiency in web page development. The student will be able to:	
	05.01	Identify website domains, and relate a site's domain name and domain category to its purpose (.gov, .mil, .org, .com, etc.)
	05.02	Relate basic components of a webpage (e.g. color, space, written content, typography, images, links, multimedia) to aesthetic, functional and/or usable design principals.
	05.03	Define aesthetic design, and explain how aesthetics can affect a visitors' perception of a website's information.
	05.04	Demonstrate knowledge of color wheel concepts and effective use of color on a website.
	05.05	Explain the CARP principles of design (contrast, alignment, repetition, proximity), and give an example of how each principle is used in designing aesthetic layouts.
	05.06	Critique the aesthetic design, usability and accessibility of sample websites.
	05.07	Define multimedia, and identify its role in webpage interactivity.
	05.08	Explain the primary steps of the website planning process.
	05.09	Apply the website planning process to plan the design for basic website.
	05.10	Build the site navigation scheme for a website.

	05.11	Define “HTML (Hypertext Markup Language)” and related terms, including tag vs. element, container vs. empty tag, block-level vs. inline element, attribute value, semantic tag.
	05.12	Identify HTML elements required to create webpage structure (!DOCTYPE, html, head, title, body)
	05.13	Create webpages using basic HTML tags (e.g., headings, lists, character styles, text alignment, tables, and comments).
	05.14	Use HTML to create hyperlinks to multiple pages in a website or to outside sources.
	05.15	Use HTML to insert common image file formats into webpages, and use an image as a hyperlink.
	05.16	Explain Cascading Style Sheet (CSS) technology.
	05.17	Apply CSS styles to an HTML page.
	05.18	Review webpage content, verify copyright restrictions, and create meta-data before publishing a site to the internet.
	05.19	Test webpages for display, functionality, and accessibility before publishing a site to the Internet.
	05.20	Validate webpage code using W3C validation tools before publishing a site to the Internet.
	05.21	Describe network issues relating to websites, including bandwidth, compression, streaming, web hosting.
	05.22	Explain the purpose of File Transfer Protocol (FTP) in accessing information on the Internet.
	05.23	Design and create a personal website using HTML and CSS with at least three different pages that are hyperlinked to the homepage.
	05.24	Publish a website.
06.0	Demonstrate proficiency in game development. The student will be able to:	
	06.01	Describe the role of games in modern society (e.g., education, task training, social networking, therapy, recreation).
	06.02	Identify various types of games (e.g., chance, skill, knowledge, role-playing, and storytelling).
	06.03	Identify the steps of the design process for creating a game.
	06.04	Apply the design process to solving a problem.
	06.05	Analyze (deconstruct) existing games.
	06.06	Identify the tools and skills needed for creating games.
	06.07	Identify design criteria and constraints.
	06.08	Create storyboards to model a game’s program flow and functionality.

06.09	Identify the programmer's role in creating games.
06.10	Identify common programming languages and applications used to create computer games.
06.11	Compare sequential, iteration (loop) and selection programming structures.
06.12	Define the term algorithm (i.e., a set of repeatable steps) and how it applies to problem solving.
06.13	Create an algorithm to solve a problem or complete a task.
06.14	Use pseudo-code to model a game program's flow.
06.15	Define logic errors and identify them in a game program or model.
06.16	Explain the types and uses of variables in game programming.
06.17	Describe basic Boolean concepts, including logical operators, order of precedence, expressions.
06.18	Describe the use of events, event handlers and functions in game programming.
06.19	Describe the use of parameters and arguments in game programming.
06.20	Describe the use of objects, classes and instances in game programming.
06.21	Describe the use of properties and methods with objects in game programming.
06.22	Write appropriate code to create a simple game using structured programming.
06.23	Test and evaluate the game program you created.
06.24	Modify the game program as needed to solve a problem.
06.25	Create an animated object (i.e., sprite) to be used in a game program.
06.26	Use programming code to control the behavior of an animated object (i.e., sprite) in a game program.
07.0	Demonstrate proficiency in basic programming. The student will be able to:
07.01	Define "programming" and discuss its role in computing.
07.02	Explain the binary representation of data and programs in computers.
07.03	Distinguish among the three types of programming languages (machine, assembly, high-level), and give examples.
07.04	Compare and contrast languages that are usually compiled (e.g., C++, Java) and interpreted (e.g., JavaScript, Python).
07.05	Describe the structure of a simple program, and explain why sequencing is important.

	07.06	Write a program design document using pseudo-code that shows program flow.
	07.07	Define the term “algorithm,” and explain how it relates to problem-solving.
	07.08	Explain the three types of programming errors (i.e., logic, syntax, runtime), and describe the forms of testing that can be used to locate and debug errors.
	07.09	Solve a problem using logic by planning a strategy, designing and testing a hypothesis, and/or creating a set of step-by-step instructions to perform a task.
	07.10	Define “structured programming” and discuss the advantages of this approach.
	07.11	Define the three main programming control structures used in structured programming: sequential, selection (decision), and iteration (loops).
	07.12	Describe iterative programming structures (e.g., while, do/while) and how they are used in programming.
	07.13	Describe selection programming structures (e.g., if/then, else) and explain the logic used for if statements.
	07.14	Write a simple program in pseudo-code that uses structured programming to solve a problem.
	07.15	Explain the types and uses of variables in programming.
	07.16	Describe fundamental Boolean concepts, including Boolean algebra, operators, and logic.
	07.17	Convert a simple program from pseudo-code into a common high-level programming environment.
	07.18	Troubleshoot and debug errors in code.
	07.19	Define “programming” and discuss its role in computing.
08.0	Demonstrate proficiency in physical computing with hardware devices. The student will be able to:	
	08.01	View hardware as an approachable and fun topic in computing.
	08.02	Believe that anyone can contribute to innovation.
	08.03	Use physical computing (aka: Microbits, Circuit Playgrounds, Arduino, Lilypads, Makey-Makey, Piper Kits, Raspberry Pi’s, etc.) to solve problems.
	08.04	Determine how computers sense and respond to their environment.
	08.05	Determine the kind of information that can be communicated with hardware outputs.
	08.06	Analyze how simple hardware can be used to develop innovative new products.
	08.07	Define prototype in relation to digital design.
	08.08	Create a prototype of an original game that can be played using a physical computing device.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

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CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

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Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Fundamentals of Artificial Intelligence (AI)**
Program Type: **Orientation/Exploratory and Career Planning**
Career Cluster: **Information Technology**

Secondary – Middle School	
Program Number	9009700
CIP Number	0511010201
Grade Level	6-8
Program Length	1 credit (2 Semesters)
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FL-TSA, SkillsUSA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to assist students in making informed decisions regarding their future academic and occupational goals and to provide information regarding careers in the Engineering & Technology Education career cluster.

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in Artificial Intelligence (AI)-enabled careers; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of AI and Machine Learning required for AI-enabled professionals working in business and academic environments. The intention of this course is to prepare students to be successful both personally and professionally in an AI-based society.

The content includes but is not limited to fundamental understanding of the Five Big Ideas in AI: Perception, Representation & Reasoning, Machine Learning, Human AI Interaction, Societal impacts of AI; AI system and their components; problems and tools AI-enabled workers use to build models and systems that leverage data to make decisions; mastery of foundational skills required to become power AI users. In addition, the course content includes but is not limited to practical experiences in AI system design, deployment, and evaluation; problem identification; creation, selection, and curation of data sets; computer programming, use of machine learning algorithms, program design structure, evaluation of the societal impact of AI, employing ethical and responsible development methodologies and decision making, essential programming techniques, and implementation issues. Specialized programming skills involving advanced mathematical calculations and statistics are also integrated into the curriculum.

Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of two course(s).

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the program structure:

Course Number	Course Title	Teacher Certification	Length
9009710	Exploring Artificial Intelligence	BUS ED 1@2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G COMP PROG 7G Science 6-12 ENG 7G EG TEC 7G EG Tech 6-12 TECH ED 1 @2 ENG & TEC ED 1@2 MATH 6-12	.5 credit
9009720	Applying Artificial Intelligence		.5 credit

Standards

After successfully completing this course, the student will be able to perform the following:

Exploring Artificial Intelligence

01.0 Identify computer components and their functions.
02.0 Demonstrate knowledge of different operating systems.
03.0 Demonstrate an understanding of Internet safety and ethics.
04.0 Demonstrate proficiency using the Internet to locate information.
05.0 Identify and define intelligent behavior.
06.0 Articulate the relationship between AI, machine learning, and computer science.
07.0 Explain the history and evolution of AI.
08.0 Define and investigate examples of AI applications.
09.0 Understand the possibilities for AI in careers as a designer, developer and user.
10.0 Understand the AI Ethics in regard to generative AI, Deep Fakes, fair use and copyright.
11.0 Design an AI application or product using an online tool.

Applying Artificial Intelligence

12.0 Identify examples of computer perception systems built into AI-enabled technologies.
13.0 Describe different types of data and how they are used in AI.
14.0 Describe the high-level processes, methods and conventions used in computer perception.
15.0 Identify and describe the types of representations and algorithms designed into AI-enabled technologies.
16.0 Understand what AI agents and how agents maintain representations of the world and use them for reasoning.
17.0 Describe machine learning and neural networks in AI-enabled technologies.
18.0 Describe the different methods computers use to learn from data (machine learning).
19.0 Collect and analyze a data set.
20.0 Conduct an investigation of a machine learning model.
21.0 Define and investigate generative AI and how it works with current applications.
22.0 Demonstrate an understanding of AI ethics in regard to data bias, algorithmic bias, adversarial AI and AI deployment.

Career and Education Planning [these must be met to satisfy the requirements of Section 1003.4156, Florida Statutes]

23.0 Explain his or her career interests, skills and values.
24.0 Describe occupations and industries in his or her region.
25.0 Describe a variety of postsecondary pathways.
26.0 Create a personalized career and academic plan.

Florida Department of Education
Student Performance Standards

Course Title: **Exploring Artificial Intelligence**
Course Number: **9009710**
Course Length: **Semester**

Course Description:

This course introduces students to the principles of Artificial Intelligence (AI). The course defines “Intelligent Behavior”, describes the relationship between AI and computer science, explains the history of AI and showcases applications of AI in the real world. Students will explore the role of data in AI applications and the algorithms which guide AI decision making. Students will engage in hands-on activities related to the use of AI in machine learning.

CTE Standards and Benchmarks	
01.0	Identify computer components and their functions. The student will be able to:
01.01	Describe what defines a computer and ways a computer can be used.
01.02	Identify the internal components of a computer (e.g., case, CPU, RAM, power supply, hard drive, motherboard, expansion cards, cabling).
01.03	Identify and know how to connect various computer input devices (e.g., mouse, keyboard, phone, camera, scanner, microphone, game controller, stylus, barcode reader fingerprint scanner, GPS device, touch pad, graphics tablet) and describe their use.
01.04	Identify and know how to connect various computer output devices (e.g., monitor, printer, projector, speakers, headphones) and describe their use.
01.05	Identify and know how to connect various storage devices (e.g., flash drive, external hard drive (SSD, network drive), memory card, discs, cloud).
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Compare and contrast various operating systems used in a computer and mobile devices (i.e., Windows, OS (Apple), UNIX, Android, iOS).
02.02	Describe and use conventional file naming conventions.
02.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
02.04	Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls).
02.05	Demonstrate proficiency in using gadgets, icons, taskbars and other pre-loaded operating system programs. (e.g., calculator, text editor, clock, volume controls, adding icons and shortcuts to taskbar and shortcut menus).
03.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:

CTE Standards and Benchmarks	
03.01	Describe risks associated with social networking sites (e.g., Facebook, Snapchat, Instagram, Twitter) and ways to reduce these risks.
03.02	Define “privacy” and relate it to the term “digital footprint”.
03.03	Practice cybersafety techniques to protect your personal information when using internet searches, email, chat rooms, and social network websites.
03.04	Describe cyberbullying, its impact on perpetrators and victims and ways to respond.
03.05	Describe risks associated with digitally sending inappropriate content (including legal issues, social consequences), and discuss methods for response, reporting, and prevention.
03.06	Describe risks associated with online gaming and identify ways to reduce these risks.
03.07	Discuss issues related to downloading music or videos from the Internet, including unethical vs. illegal actions.
03.08	Compare and contrast rules for copyright and fair use, especially in relation to using online resources for school and educational purposes.
03.09	Distinguish between viruses and malware and discuss their impact on personal privacy and computer operation.
03.10	Describe common threats used to spread malware and viruses, including phishing, pharming, Trojans, spyware, malicious sites, “free” downloads.
03.11	Perform an antivirus scan on a computer system to check for viruses and malware.
03.12	Describe strong password practices.
03.13	Practice cyber safety techniques to protect your computer system when using Internet searches, email and social network websites.
03.14	Identify security issues related to mobile phones, including personal information compromised if a phone is lost or stolen.
03.15	Adhere to Acceptable Use Policies when accessing the Internet.
04.0	Demonstrate proficiency using the Internet including AI to locate information. The student will be able to:
04.01	Identify and use web terminology (WWW, Web Browser, Internet, Web Server, Web Page, Address Bar, Hyperlinks, Navigation Buttons, Search Bar, Bookmarks/Favorites, Tab, Downloading, Plug-ins, Social Media Plug-ins).
04.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto).
04.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
04.04	Demonstrate proficiency using search engines, including Boolean search techniques.
04.05	Compare search results to an AI GPT model to see if they both return the same verifiable information. Understand why these might be the same or different.
04.06	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF).
04.07	Compare and contrast the roles of web servers and web browsers.
04.08	Evaluate online information for relevance, credibility and quality using basic guidelines and indicators (e.g. authority, affiliation,

CTE Standards and Benchmarks	
	purpose, bias, date).
04.09	Identify and apply copyright and fair use guidelines and explain plagiarism as an ethical and legal violation.
04.10	Incorporate results from Internet searches into a research project (e.g., report, summary).
04.11	Download images as needed to support a research project, complying with copyright notices.
04.12	Properly cite Internet sources used to obtain information for a research project.
05.0	Identify and define intelligent behavior. The student will be able to:
05.01	Explain that "knowing" something means the ability to both represent and reason with it.
05.02	Explain the difference between knowledge/information and “knowing” (e.g., books can represent knowledge, but they do not "know" things because they cannot make use of that knowledge.)
05.03	Know and state conditions where behavior is intelligent using non-trivial sense-deliberate-act cycle.
05.04	Identify examples of intelligent and non-intelligent machine/agent behavior
06.0	Articulate the relationship between AI, Machine Learning, and Computer Science. The student will be able to:
06.01	Describe computer science as a discipline focused on the study of computers and algorithmic processes, including their principles, their hardware and software designs, their implementation, and their impact on society.
06.02	Describe AI as a branch of computer science that studies the science and engineering of making intelligent machines, especially intelligent computer programs that enable them to make predictions, decisions, plans, and solve problems.
06.03	Describe machine learning as a set of techniques that enables a computer system to learn from data rather than through explicit programming. Machine learning techniques can be used to build models that solve problems, make predictions, and make decisions.
06.04	Describe the differences between the field of AI and ML
07.0	Explain the history and evolution of AI. The student will be able to:
07.01	Research AI and reflect on its current state.
08.0	Define and investigate examples of AI applications. The student will be able to:
08.01	Identify and describe current examples of AI applications in everyday life
08.02	Identify and describe AI technologies students interact with frequently and determine what problems and/or needs the AI is intended to solve.
08.03	Investigate how the different examples AI you interact with daily work and determine what type(s) of AI is being used
08.04	Discuss how AI is and could be used to enhance areas of student interest, real-world problems, business needs, and the future of work.
08.05	Identify and analyze how AI is impacting art and other creative fields.

CTE Standards and Benchmarks	
	08.06 Define critical and contemporary areas of AI including machine learning, natural language processing, and computer vision.
09.0	Understand the possibilities for AI in careers as a designer, developer and user. The student will be able to:
	09.01 Identify and describe current career opportunities for AI designers, developers and users.
	09.02 Identify and describe AI Careers and the how responsibilities and skills differ for designers, developers and users.
	09.03 Investigate how the different Career paths and the skills and education requirements differ between them.
	09.04 Research, or Host speakers to understand what the career pathways in AI are and how someone who works in an AI position function to use or develop AI in their career.
10.0	Understand the AI Ethics in regard to generative AI, Deep Fakes, fair use and copyright. The student will be able to:
	10.01 Distinguish between credible and unreliable information sources.
	10.02 Recognize and describe signs of compromised information or data.
	10.03 Understand what the definition of fair use is for both Data and AI generated works.
	10.04 Understand copyright laws and the ways AI generated work impacts the current understanding of copyright
11.0	Design an AI application or product using an online tool. The student will be able to do:
	11.01 Plan and conduct an experiment using a web tool that creates a AI app or generative AI product using a prompt or data set
	11.02 Predict what information the trained model from your experiment might use to classify data or create the product.
	11.03 Analyze and examine the app or product to see if there are ethical issues with the product.
	11.04 Communicate your findings through an oral or written presentation.

Florida Department of Education
Student Performance Standards

Course Title: **Applying Artificial Intelligence**
Course Number: **9009720**
Course Length: **Semester**

Course Description:

This course has students apply what they have learned about Artificial Intelligence to real world situations. The course defines how computer systems build intelligence through perception. Students will explore the role of data in AI applications and the algorithms which guide AI decision making. Students will engage in hands-on activities related to use of AI in machine learning.

CTE Standards and Benchmarks	
12.0	Identify examples of computer perception systems built into AI-enabled technologies. The student will be able to:
12.01	Explain differences between sensing in intelligent vs. non-intelligent machines.
12.02	Identify basic types of perception algorithms and explain how they are used in real-world applications.
12.03	Describe and provide examples of the advantages and limitations of sensors and computer perception and their impact on meaning making.
13.0	Describe different types of data and how they are used in AI. The student will be able to:
13.01	Identify the different kinds of data we collect and share as Internet users.
13.02	Define numeric, text, date, graphics and sound types of data that computers use.
13.03	Distinguish that data requires context to be information.
13.04	Describe how computers store data using bits (binary digits).
13.05	Describe and construct a simple model of the data processing cycle (input-processing-output).
13.06	Define Big Data and describe how it is used in AI.
13.07	Describe how AI uses data to make predictions or decisions.
13.08	Define logic and summarize its use in programming, including AI.
14.0	Describe the high-level processes, methods, and conventions used in computer perception. The student will be able to:
14.01	Describe the differences between human senses vs. animal senses vs. computer sensors in capturing, storing/representing, and making meaning from data.
14.02	Explain how AI move from sensing data to perceiving meaning for language and vision systems (e.g., sense, perceive, act cycle)
14.03	Illustrate abstraction hierarchies for speech understanding and perceptual reasoning to highlight the relationship between higher

	level and lower levels of abstraction in resolving ambiguities in the levels below.
15.0	Identify and describe the types of representations and algorithms designed into AI-enabled technologies. The student will be able to:
15.01	Identify different types of representations in AI and their uses.
15.02	Explain how heuristic, combinatorial, state space search algorithms and operators are commonly used in AI to find answers to questions and problems.
15.03	Identify and describe classification, approximation, inference, optimization, recognition, search families of reasoning algorithms and the work they do.
15.04	Identify and explain how AI representations and types of reasoning are used in AI systems used in everyday life.
16.0	Explain how agents maintain representations of the world and use them for reasoning. The student will be able to:
16.01	Explain how representation supports reasoning and reasoning algorithms operate on representations.
16.02	Describe and provide examples of common implementations of decision trees, rule-based inference, and statistical inference reasoning algorithms and their advantages and limitations in solving problems (human interpretability, transparency).
17.0	Describe machine learning and neural networks in AI-enabled technologies. The student will be able to:
17.01	Explain the difference between machine learning and human learning.
17.02	Identify supervised, unsupervised, reinforcement, and transfer learning types of machine learning) and provide examples of the types of problems they solve.
17.03	Identify CNN, RNN, GAN types of neural networks and the image classification, speech recognition, deep fakes/creativity/art applications they are used in.
18.0	Describe the different methods computers use to learn from data (Machine Learning). The student will be able to
18.01	Explain how supervised, unsupervised, reinforcement, and transfer learning function.
18.02	Identify and describe layers (input, hidden, output), activation functions, learning rules and transfer learning components of a neural network and explain how they function.
18.03	Explain how CNN, RNN, GAN types of neural networks function.
19.0	Collect and analyze a data set. The student will be able to:
19.01	Identify different kinds of data and how they might be used in decision making
19.02	Describe and construct a simple model of the data processing cycle (input-processing-output).
19.03	Collect, organize, manipulate and analyze different types of data using preset spreadsheet functions.
19.04	Analyze one or more online datasets, describe the information the datasets provide, and identify the types of questions it can and cannot answer
19.05	Analyze data to construct informed summaries, decisions, and predictions related to the data.
19.06	Use spreadsheet functions to create tables and graphs to visually represent and communicate data.
19.07	Explain and demonstrate the ways training data influences learning and decisions made by the model.

20.0	Conduct an investigation of a Machine Learning Model. The student will be able to do:
20.01	Plan and conduct an experiment using a web tool that trains a machine learning model without coding to train a model to recognize data and distinguish between at least three different categories.
20.02	Predict what information the trained model from your experiment might use to classify data.
20.03	Construct an argument using data that explains how your machine learning experiment model works and evaluate if it was. successful
20.04	Plan and conduct an experiment using a Computer Vision service to analyze an image dataset from an online source.
20.05	Plan and conduct an experiment using a Text Analytics service to analyze a text dataset from an online source.
21.0	Define and investigate generative AI and how it works and current applications. The student will be able to do:
21.01	Understand what Generative AI is and the basics of how it works.
21.02	Use a generative AI tool to create some product
21.03	Predict what information the trained model from your experiment might use to classify data. Predict the outcome of the generative AI.
21.04	Examine the product for ethical issues for fair use, data sets and copyright.
22.0	Demonstrate an understanding of AI ethics in regard to data bias, algorithmic bias, adversarial AI and AI deployment. The student will be able to:
22.01	Define bias, perception, privacy, and accuracy in the context of AI.
22.02	Explore potential examples of bias using a web tool that trains a machine learning model without coding.
22.03	Describe and critique how ethics and philosophy explicitly and implicitly play a role in AI applications.
22.04	Explain the ways in which developing an AI application involves humans making numerous technical and ethical decisions.
22.05	Explain the key principles of responsible and ethical AI design that result in AI systems that keep fairness, transparency, explainability, human-centeredness, privacy and security interests of users in mind.
22.06	Explain the range of views on the need for and types of ethical standards for AI systems that make decisions about people.
22.07	Describe the importance of minimizing bias in AI systems to increase people’s trust in AI systems.
22.08	Identify the sources of bias in AI systems and models and explain the key approaches to minimizing bias.
22.09	Describe group and individual types of fairness and various views of fairness that affect the metrics for evaluating fairness in systems.
22.10	Describe model, algorithm, data, goals, outcomes, compliance, influence, and usage principles of transparency in AI and explain the regulatory, responsibility, privacy, security considerations that are important when making decisions with AI systems.
22.11	Explain the challenges of implementing transparency in AI for companies such as vulnerabilities and security, privacy, intellectual property, legal and risk management.
22.12	Understand and provide examples of how AI can become adversarial to others or to its intended purpose.
22.13	Provide examples of the judgements humans in the loop make in the development of AI, and the responsibility they have to consider

	the system's impact in the world.
22.14	Explain how AI designers and developers have an ethical responsibility to be able to explain how AI systems and their components work.
22.15	Provide examples or explain how a company, developer, or decision maker can establish accountability in the development and use of AI to make decisions (e.g., codes of ethics/responsible design, ethical design consideration and choices, and decision tracking).
22.16	Understand the subjective nature of values across cultures and describe the key principles, importance, and challenges of designing AI to align with the norms and values of the user group in mind (e.g., understanding user's values, culture, and norms; defining the value system the AI system is designed for).
22.17	Describe the expertise and process needed to ethically design AI to support users (e.g., multi-disciplinary team incl. Ethicist/sociologist, developers, legal/compliance, tracking, etc.).

Career and Education Planning [these must be met to satisfy the requirements of Section 1003.4156, Florida Statutes]

Standards and Benchmarks	
23.0	Explain his or her career interests, skills and values. The student will be able to:
23.01	Describe his or her career interests based on a career interest assessment, personal experience, career informational interviews, research and/or reflection.
23.02	Describe what career-related skills are his or her current strengths or could become strengths in the future with practice and training based on a career skill assessment, personal experience and/or reflection.
23.03	Describe what lifestyle and workplace values are most important to them to consider during career decision making, such as salary and benefits, work environment, the nature of the work and work/life balance.
23.04	Describe what values that relate to positively impacting others and the world are most important to them to weigh during career decision making.
24.0	Describe occupations and industries in his or her region. The student will be able to:
24.01	Define Career Clusters, industries and occupations.
24.02	Define regional poverty, average and family-sustaining wage thresholds.
24.03	Review local labor market data to identify the top five regional occupations as relates to each of the following: employment, growth and salary.
24.04	List three occupations that align with his or her personal career interests, skills and values.
24.05	List the regional salary, employment and growth of three occupations they are most interested in learning more about.
24.06	Summarize occupational content learned through a career informational interview, career fair, job shadowing, service learning, guest speaker, project-based learning, work-based learning, worksite visit or other firsthand experience.
25.0	Describe a variety of postsecondary pathways. The student will be able to:
25.01	Evaluate the pros and cons of pursuing education, employment, entrepreneurship or enlistment immediately following high school.
25.02	Define postsecondary training provider options and their admissions requirements, including apprenticeships, technical colleges, state or community colleges, universities and industry-recognized certification providers.

	25.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees
	25.04	Explain training options aligned with his or her career assessment results and occupational exploration.
	25.05	Review postsecondary training data and list the total cost, average debt after graduation and median earnings and job placement rates of students who completed the student's preferred postsecondary training option.
	25.06	Summarize what they learned about his or her preferred postsecondary training provider through online research; virtual or in-person tours; a college fair; and/or interviewing a current student, alumni or staff member.
26.0	Create a personalized career and academic plan. The student will be able to:	
	26.01	Prioritize an occupation for plan formation using one or more decision making techniques, such as a decision matrix, pros and cons analysis or other means
	26.02	Explain the reasoning for choosing to pursue his or her preferred occupation
	26.03	Identify which credentials, technical skills, and employability or entrepreneurship skills are relevant to his or her preferred career pathway.
	26.04	Prioritize a recognized postsecondary credential (industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees) aligned with his or her chosen occupation using a decision-making technique, such as a decision matrix and/or pros and cons analysis, etc.
	26.05	Prioritize a postsecondary training provider aligned with his or her recognized postsecondary credential goal using a decision-making technique, such as a decision matrix and/or pros and cons analysis, etc.
	26.06	Define means of paying for postsecondary training, including scholarships (must include State scholarships), grants, savings, work, work-study programs, private loans and Federal loans.
	26.07	Describe ways of meeting the requirements of Florida's graduation pathways and obtaining accelerated credit, work-based learning experience, career and technical education credit and industry-recognized certifications in high school.
	26.08	Develop a freshman year course schedule that meets high school graduation requirements and that provides academic and career preparation aligned with the student's career goals.
	26.09	Identify extracurricular activities aligned with his or her occupational and postsecondary training goals.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at SALA@fldoe.org.

Special Notes

It is recommended that these courses be offered at the 8th grade level.

Career Planning

Effective July 1, 2019, per Section 1003.4156, Florida Statutes (F.S.), for students to meet middle grades promotion requirements, a Career and Education Planning course must be completed in either sixth, seventh, or eighth grade. These courses should be taught integrating the eight career and education planning course standards.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Artificial Intelligence (AI) Foundations**
Program Type: **Non-Career Preparatory**
Career Cluster: **Information Technology**

Secondary – Non-Career Preparatory	
Program Number	9401100
CIP Number	0611010200
Grade Level	9-12
Program Length	3 credits
Teacher Certification	Refer to the **Program Structure** section.
CTSO	FL-TSA, Skills USA
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in Artificial Intelligence (AI)-enabled careers; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of AI and Machine Learning required for AI-enabled professionals working in business and academic environments. The intention of this course is to prepare students to be successful both personally and professionally in an AI-based society.

The content includes fundamental understanding of the Five Big Ideas in AI: Perception, Representation & Reasoning, Machine Learning, Human AI Interaction, Societal impacts of AI; AI system and their components; problems and tools AI-enabled workers use to build models and systems that leverage data to make decisions; mastery of foundational skills required to become power AI users. In addition, the course content includes but is not limited to practical experiences in AI system design, deployment, and evaluation; problem identification; creation, selection, and curation of data sets; computer programming, use of machine learning algorithms, program design structure, evaluation of the societal impact of AI, employing ethical and responsible development methodologies and decision making, essential programming techniques, and implementation issues. Specialized programming skills involving advanced mathematical calculations and statistics are also integrated into the curriculum.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 4 courses.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the secondary program structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
9401010	Artificial Intelligence in the World	BUS ED 1@2 COMPU SCI 6 INFO TECH 7G WEB DEV 7G COMP PROG 7G ENG 7G EG TEC 7G TECH ED 1 @2 ENG & TEC ED 1@2 MATH 6-12	0.5 credit	3	CT
9401020	Applications of Artificial Intelligence		0.5 credit	3	CT
9007220	Intermediate Programming	BUS ED 1@2 COMPU SCI 6 COMP PROG 7G	1 credit	3	CT
9401040	Foundations of Machine Learning	Refer to the first two courses for the Teacher Certifications	1 credit	2	CT

(Graduation Requirement Codes: CT=Career & Technical Education, EQ= Equally Rigorous Science, EC= Economics, MA=Mathematics, PL=Personal Financial Literacy)

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Career Exploration & Planning	
10.0	Explain career opportunities aligned with the regional economy and personal aspirations.
10.01	Describe regional occupations that are high-demand, high-growth, high-wage and/or high-skill.
10.02	Describe careers aligned with his or her interests, skills and values based on career assessment, experiential learning, career informational interviews, research and/or reflection.
11.0	Explain postsecondary pathways aligned with his or her career aspirations.
11.01	Compare and contrast postsecondary pathways, including education, employment, entrepreneurship and enlistment (the “Four Es”).
11.02	Compare and contrast regional postsecondary training provider options, including apprenticeships, technical colleges, state colleges, universities and industry-recognized certification providers.
11.03	Define postsecondary credentialing and stacking options, including industry-recognized certifications, apprenticeship certificates of completion, career certificates, licenses and associate or baccalaureate degrees.
11.04	Compare postsecondary training data for training programs of interest, such as total costs, average student loan debt, and median earnings and job placement rates after program completion.
12.0	Develop a personalized career and academic plan.
12.01	Prioritize an occupation, credential and postsecondary training provider for plan formation.
12.02	Self-assess progress toward meeting graduation requirements and skill-development goals.
12.03	Develop and complete a chronological checklist of steps and deadlines prior to postsecondary training or national service application that includes any required documentation to gather, writing prompts and examinations.
12.04	Identify a variety of financial aid opportunities, including scholarships, grants, savings, work, work-study programs, private loans and federal loans.
12.05	Develop a postsecondary training budget that is inclusive of living and school expenses.
Job Attainment	
13.0	Find, assess and apply to job opportunities.
13.01	Identify online job posts relevant to his or her career aspirations.
13.02	Compare and contrast the job posts’ required qualifications, job duties, compensation, benefits and employers.
13.03	Define what information, documentation and writing prompts are required for the positions.
14.0	Communicate personal competence, character and fit for a job opportunity.
14.01	Develop a resume.
14.02	Write a cover letter.
14.03	Curate a professional portfolio that includes work products.
14.04	Prepare for and experience a mock job interview.

15.0	Cultivate and leverage relationships to professionally advance.
	15.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	15.02 Develop a plan to cultivate a professional digital footprint.
	15.03 Develop a networking plan for a specific industry of interest.

Standard

After successfully completing this program, the student will be able to perform the following:

Artificial Intelligence in the World

01.0 Identify and define intelligent behavior.
02.0 Articulate the relationship between AI, machine learning, and computer science.
03.0 Explain the history and evolution of AI
04.0 Define and investigate examples of AI applications.
05.0 Identify examples of computer perception systems built into AI-enabled technologies.
06.0 Describe different types of data and how they are used in AI.
07.0 Describe the high-level processes, methods and conventions used in computer perception.
08.0 Identify and describe the types of representations and algorithms designed into AI-enabled technologies.
09.0 Explain how agents maintain representations of the world and use them for reasoning.
10.0 Describe machine learning and neural networks in AI-enabled technologies.
11.0 Describe the different methods computers use to learn from data (machine learning).
12.0 Collect and analyze a data set.
13.0 Conduct an investigation of a machine learning model.
14.0 Characterize major elements of intelligent behavior.
15.0 Explain how domain knowledge is used in the design of AI systems.
16.0 Articulate the many types of knowledge needed by AI agents to interact naturally with humans and the current limitations of AI to interact naturally with humans.
17.0 Understand and articulate how AI can impact society in both positive and negative ways.
18.0 Explain the best practices and key characteristics of bias, fairness, transparency, explainability, accountability of ethically designed AI systems and decision-making practices.
19.0 Identify deep fakes and explain critical information processing.

Applications of Artificial Intelligence

20.0 Design and evaluate a perception system and its limits.
21.0 Train and evaluate a range of ML models based on specific accuracy, inclusivity, and ethical design criteria.
22.0 Design and evaluate a data set to solve a problem using specific accuracy, inclusivity, ethical design criteria.
23.0 Design AI solutions using embedded computing.
24.0 Explore the characteristics, tasks, work attributes, options, and tools associated with AI-enabled careers.
25.0 Identify how leadership development, school and community service projects and competitive events are integral parts of career and technology education.
26.0 Use appropriate tools to design an AI System to solve problems.
27.0 Characterize important issues related to privacy and security in the development and use of AI-enable technologies.
28.0 Explain the key technical challenges in design and responsible use of AI technologies.
29.0 Set up and use a ML pipeline to solve a problem.
30.0 Appropriately use automated AI services to accomplish common tasks.

31.0 Explain and use design thinking to solve a problem.
32.0 Show how a system is composed and interacts and be able to express verbally, graphically and in writing how the system functions.
33.0 Understand and interpret different types of data.
34.0 Understand how data is accessed, sorted, and stored.
35.0 Generate and tell stories with data.
36.0 Think critically about data.

Intermediate Programming
37.0 Design a computer program to meet specific physical, operational and interaction criteria.
38.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
39.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.
40.0 Effectively communicate and collaborate.
41.0 Demonstrate responsible use of technology and information.
42.0 Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages.

Foundations of Machine Learning
43.0 Explain the nature of representations and their importance in AI.
44.0 Use search algorithms to reason with symbolic representations.
45.0 Explain the relationship between representation and reasoning.
46.0 Explain the nature of machine learning.
47.0 Use and evaluate supervised learning techniques to classify or predict outputs.
48.0 Use and evaluate unsupervised learning techniques to solve problems.
49.0 Use and evaluate reinforcement learning techniques to solve problems.
50.0 Use and evaluate different types of neural network architectures and their applications.
51.0 Illustrate Neural Networks and their components.
52.0 Recognize and identify mathematical principles upon which machine learning and AI are built such as calculus, linear algebra, probability, statistics, and optimization partial derivatives.
53.0 Use the most common machine learning algorithms to solve a problem.
54.0 Identify the types of problems that can be solved with machine learning algorithms.
55.0 Evaluate the sources of bias in machine learning/AI and identify appropriate mitigation strategies.
56.0 Program machine learning algorithms to train a model on real world data, then evaluate the results.
57.0 Identify different kinds of data, sources, and how they might be used in decision making.
58.0 Explain the characteristics, collection, storage, and uses of datasets in AI.
59.0 Work with datasets to gain insight, using data analysis and visualization tools.
60.0 Critique data and data-based claims to avoid being misled by data through identifying bias, confounding and random error.
61.0 Apply the machine learning life cycle in the development and use of a machine learning model.
62.0 Design and develop AI systems to solve a problem or design solutions for social and ethical issues.
63.0 Understand how machine learning is applied to solve problems.
64.0 Describe the limitations of machine learning and the decisions that can be made with data.

65.0 Evaluate societal impacts of AI on individuals, society, and the environment.
66.0 Evaluate AI applications to ensure they provide solutions to difficult problems without any unintended negative consequences.
67.0 Research and explain the advancements in computing hardware that make AI possible.
68.0 Create a portfolio of AI projects that demonstrate the ability to program machine learning models using a wide range of AI algorithms.
69.0 Research and evaluate various AI careers involved in AI system usage, design, development, deployment, and maintenance.

Florida Department of Education
Student Performance Standards

Course Title: **Artificial Intelligence in the World**
Course Number: **9401010**
Course Credit: **0.5**

Course Description:

This course introduces students to the principles of Artificial Intelligence (AI). The course defines “Intelligent Behavior”, describes the relationship between AI and computer science, explains the history of AI and showcases applications of AI in the real world. Students will explore the role of data in AI applications and the algorithms which guide AI decision making. Students will learn about the role of perception in AI and how AI agents use information in decision making. Students will engage in hands-on activities related to use of AI in machine learning. This course also covers ethics in AI applications.

CTE Standards and Benchmarks	
01.0	Identify and define intelligent behavior. The student will be able to:
01.01	Explain that "knowing" something means the ability to both represent and reason with it.
01.02	Explain the difference between knowledge/information and “knowing” (e.g., books can represent knowledge, but they do not "know" things because they cannot make use of that knowledge.)
01.03	Know and state conditions where behavior is intelligent using non-trivial sense-deliberate-act cycle.
01.04	Identify examples of intelligent and non-intelligent machine/agent behavior
02.0	Articulate the relationship between AI, Machine learning, and Computer Science. The student will be able to:
02.01	Describe computer science as a discipline focused on the study of computers and algorithmic processes, including their principles, their hardware and software designs, their implementation, and their impact on society.
02.02	Describe AI as a branch of computer science that studies the science and engineering of making intelligent machines, especially intelligent computer programs that enable them to make predictions, decisions, plans, and solve problems.
02.03	Describe machine learning as a set of techniques that that enables a computer system to learn from data rather than through explicit programming. Machine learning techniques can be used to build models that make solve problems, make predictions, and make decisions.
02.04	Describe the differences between the field of AI and ML
03.0	Explain the history and evolution of AI. The student will be able to:
03.01	Research AI and reflect on its current state.

CTE Standards and Benchmarks	
	03.02 Describe the history and evolution of AI over time.
	03.03 Identify important early examples of AI and contributors to AI development.
	03.04 Describe how AI could be used to solve problems, including historical, current, and future problems.
04.0	Define and investigate examples of AI applications. The student will be able to:
	04.01 Identify and describe current examples of AI applications in everyday life
	04.02 Identify and describe AI technologies students interact with frequently and determine what problems and/or needs the AI is intended to solve.
	04.03 Investigate how the different examples AI you interact with daily work and determine what type(s) of AI is being used
	04.04 Discuss how AI is and could be used to enhance areas of student interest, real-world problems, business needs, and the future of work.
	04.05 Identify and analyze how AI is impacting art and other creative fields.
	04.06 Define critical and contemporary areas of AI including machine learning, natural language processing, and computer vision.
05.0	Identify examples of computer perception systems built into AI-enabled technologies. The student will be able to:
	05.01 Explain differences between sensing in intelligent vs. non-intelligent machines.
	05.02 Identify basic types of perception algorithms and explain how they are used in real-world applications.
	05.03 Describe and provide examples of the advantages and limitations of sensors and computer perception and their impact on meaning making.
06.0	Describe different types of data and how they are used in AI. The student will be able to:
	06.01 Identify the different kinds of data we collect and share as Internet users.
	06.02 Define numeric, text, date, graphics and sound types of data that computers use.
	06.03 Distinguish that data requires context to be information.
	06.04 Describe how computers store data using bits (binary digits).
	06.05 Describe and construct a simple model of the data processing cycle (input-processing-output).
	06.06 Define Big Data and describe how it is used in AI.
	06.07 Describe how AI uses data to make predictions or decisions.

CTE Standards and Benchmarks	
	06.08 Define logic and summarize its use in programming, including AI.
07.0	Describe the high-level processes, methods, and conventions used in computer perception. The student will be able to:
	07.01 Describe the differences between human senses vs. animal senses vs. computer sensors in capturing, storing/representing, and making meaning from data.
	07.02 Explain how AI move from sensing data to perceiving meaning for language and vision systems (e.g., sense, perceive, act cycle)
	07.03 Illustrate abstraction hierarchies for speech understanding and perceptual reasoning to highlight the relationship between higher level and lower levels of abstraction in resolving ambiguities in the levels below.
08.0	Identify and describe the types of representations and algorithms designed into AI-enabled technologies. The student will be able to:
	08.01 Identify different types of representations in AI and their uses.
	08.02 Explain how heuristic, combinatorial, state space search algorithms and operators are commonly used in AI to find answers to questions and problems.
	08.03 Identify and describe classification, approximation, inference, optimization, recognition, search families of reasoning algorithms and the work they do.
	08.04 Identify and explain how AI representations and types of reasoning are used in AI systems used in everyday life.
09.0	Explain how agents maintain representations of the world and use them for reasoning. The student will be able to:
	09.01 Explain how representation supports reasoning and reasoning algorithms operate on representations.
	09.02 Describe and provide examples of common implementations of decision trees, rule-based inference, and statistical inference reasoning algorithms and their advantages and limitations in solving problems (human interpretability, transparency).
10.0	Describe machine learning and neural networks in AI-enabled technologies. The student will be able to:
	10.01 Explain the difference between machine learning and human learning.
	10.02 Identify supervised, unsupervised, reinforcement, and transfer learning types of machine learning) and provide examples of the types of problems they solve.
	10.03 Identify CNN, RNN, GAN types of neural networks and the image classification, speech recognition, deep fakes/creativity/art applications they are used in.
11.0	Describe the different methods computers use to learn from data (Machine Learning). The student will be able to
	11.01 Explain how supervised, unsupervised, reinforcement, and transfer learning function.
	11.02 Identify and describe layers (input, hidden, output), activation functions, learning rules and transfer learning components of a neural network and explain how they function.
	11.03 Explain how CNN, RNN, GAN types of neural networks function.

CTE Standards and Benchmarks	
	11.04 Explain the difference between systems designed using symbolic AI vs neural networks
12.0	Collect and analyze a data set. The student will be able to:
	12.01 Identify different kinds of data and how they might be used in decision making
	12.02 Describe and construct a simple model of the data processing cycle (input-processing-output).
	12.03 Collect, organize, manipulate and analyze different types of data using preset spreadsheet functions.
	12.04 Analyze one or more online datasets, describe the information the datasets provide, and identify the types of questions it can and cannot answer
	12.05 Analyze data to construct informed summaries, decisions, and predictions related to the data.
	12.06 Use spreadsheet functions to create tables and graphs to visually represent and communicate data.
	12.07 Explain and demonstrate the ways training data influences learning and decisions made by the model.
13.0	Conduct an investigation of a Machine Learning Model. The student will be able to do:
	13.01 Plan and conduct an experiment using a web tool that trains a machine learning model without coding to train a model to recognize data and distinguish between at least three different categories.
	13.02 Predict what information the trained model from your experiment might use to classify data.
	13.03 Construct an argument using data that explains how your machine learning experiment model works and evaluate if it was. successful
	13.04 Plan and conduct an experiment using a Computer Vision service to analyze an image dataset from an online source.
	13.05 Plan and conduct an experiment using a Text Analytics service to analyze a text dataset from an online source.
14.0	Characterize major elements of intelligent behavior. The student will be able to:
	14.01 Explain differences between intelligent vs. non-intelligent machines.
	14.02 Explain common sense reasoning, emotional intelligence, deductive, and inductive reasoning and characteristics of quintessential human intelligence.
	14.03 Explain and provide examples of intelligent behavior through computer modeling and robotics.
	14.04 Describe the major branches of AI including expert systems, natural language processing, machine perception, machine learning.
	14.05 Describe the limitations of AI for natural interaction.
	14.06 Identify and debate the issues of AI and consciousness (e.g., human-level consciousness vs. similar outcomes).

CTE Standards and Benchmarks	
	14.07 Explain why common-sense reasoning is hard for AI.
	14.08 Identify the types of problems that are difficult for AI to solve (e.g, AI General Intelligence/Strong AI, natural language understanding, computer vision)
	14.09 Explain the basic concepts involved with determining consciousness and understanding philosophy of mind.
15.0	Explain how domain knowledge is used in the design of AI systems. The student will be able to:
	15.01 Understand and describe how AIAI systems rely on domain knowledge from many fields including visual perception, linguistics, human behavior, psychology, anatomy and physiology, philosophy, mathematics.
	15.02 Explain how domain knowledge in AI systems can be provided by human experts or derived from statistics collected from millions of sentences, images, or expert labeled data.
	15.03 Explain and demonstrate how natural language understanding including speech recognition, speech generation, speech translation is used in speech recognition systems.
	15.04 Explain and demonstrate how human language can be ambiguous and strategies AI uses to resolve ambiguity.
	15.05 Explain and demonstrate how domain knowledge is used to determine ambiguity in human writing.
	15.06 Explain and demonstrate how domain knowledge is used to classify, compare, or generate music.
	15.07 Explain and demonstrate how domain knowledge is used to play board games and solve puzzles.
	15.08 Explain and demonstrate how domain knowledge is used to recognize faces, gestures, and scenes.
	15.09 Explain and demonstrate how domain knowledge is used to recognize affect from images (e.g., gestures, facial expressions).
	15.10 Explain and demonstrate how domain knowledge is used to recognize sentiment from text or speech.
	15.11 Identify and demonstrate the use of domain knowledge in the creation and use of medical diagnosis, finance, or manufacturing systems.
	15.12 Understand that domain knowledge and best practices can be one-way human bias can affect the decisions AI systems make, either in the collection and selection of examples to train systems or the interpretation of results of an AI system.
16.0	Articulate the many types of knowledge needed by AI agents to interact naturally with humans and the current limitations of AI to interact naturally with humans. The student will be able to:
	16.01 Identify how natural language understanding of tone, speaker intent and similar attributes impacts AI systems.
	16.02 Explain why it is challenging for AI to demonstrate common sense reasoning to include identification of characteristics of commonsense knowledge and causal reasoning how these differ from encyclopedic knowledge and statistical inference.
	16.03 Explore the knowledge and techniques used by AI systems to understand and recognize human affect or emotion and sentiment
	16.04 Identify and describe the range of natural interactions used to develop AI applications.

CTE Standards and Benchmarks	
	16.05 Explore the AI techniques used to approximate human creativity (e.g., art, music, prose)
	16.06 Explore the techniques use to facilitate smooth human-robot interaction.
	16.07 Explore the limitations of AI for supporting natural interactions.
	16.08 Identify, explain and debate the issues of AI and consciousness.
	16.09 Construct a chatbot and describe the factors that constrain the range of responses.
	16.10 Experiment with software that recognizes emotions in facial expressions.
	16.11 Describe the types of tasks where AI outperforms humans and those where humans outperform AI.
17.0	Understand and articulate how AI can impact society in both positive and negative ways. The student will be able to:
	17.01 Explain the ways that AI Impacts different communities/people in different ways.
	17.02 Demonstrate the use of AI is an economic driver that makes new services possible and businesses more efficient.
	17.03 Describe the ways AI technologies are changing business, healthcare, education, and government.
	17.04 Explain and provide examples of the ways AI and robotics will change the way people work, create new jobs, and eliminate some jobs.
	17.05 Identify, research, and analyze current events in the field of AI, considering new technology developments, social and ethical impact, and future implication.
	17.06 Identify and describe current challenges and opportunities in AI technologies using non-Machine Learning aspects of AI such as genetic algorithms, robotics, and computer vision.
	17.07 Make predictions about the future trends or developments in the field of AI based on current AI applications.
	17.08 Research the purpose of organizations that consider how AI can be used for social and ethical good and describe their role in AI development.
	17.09 Define and compare ethical and legal implications of AI.
	17.10 Identify and describe ethical and societal AI issues in a variety of settings such as public safety, financial implications, social media marketing, government uses, different cultures and countries.
	17.11 Analyze participation in collective online activities considering the possibilities over problems, opportunities over risks, and community successes over personal gain.
	17.12 Explain the ethical use of technology and digital content with a specific understanding of ownership, licensing, and fair use.
	17.13 Students understand consequences of inappropriate technology use.

CTE Standards and Benchmarks	
18.0	Explain the best practices and key characteristics of bias, fairness, transparency, explainability, accountability of ethically designed AI systems and decision-making practices. The student will be able to:
18.01	Define bias, perception, privacy, and accuracy in the context of AI.
18.02	Explore potential examples of bias using a web tool that trains a machine learning model without coding.
18.03	Describe and critique how ethics and philosophy explicitly and implicitly play a role in AI applications.
18.04	Explain the ways in which developing an AI application involves humans making numerous technical and ethical decisions.
18.05	Explain the key principles of responsible and ethical AI design that result in AI systems that keep fairness, transparency, explainability, human-centeredness, privacy and security interests of users in mind.
18.06	Explain the range of views on the need for and types of ethical standards for AI systems that make decisions about people.
18.07	Describe the importance of minimizing bias in AI systems to increase people's trust in AI systems.
18.08	Identify the sources of bias in AI systems and models and explain the key approaches to minimizing bias.
18.09	Describe group and individual types of fairness and various views of fairness that affect the metrics for evaluating fairness in systems.
18.10	Describe model, algorithm, data, goals, outcomes, compliance, influence, and usage principles of transparency in AI and explain the regulatory, responsibility, privacy, security considerations that are important when making decisions with AI systems.
18.11	Explain the challenges of implementing transparency in AI for companies such as vulnerabilities and security, privacy, intellectual property, legal and risk management.
18.12	Provide examples of how explainability vs. interpretability is the most effective means of ensuring AI solutions are transparent, accountable, responsible, fair, and ethical across use cases and industries.
18.13	Provide examples of the judgements humans in the loop make in the development of AI, and the responsibility they have to consider the system's impact in the world.
18.14	Explain how AI designers and developers have an ethical responsibility to be able to explain how AI systems and their components work.
18.15	Provide examples or explain how a company, developer, or decision maker can establish accountability in the development and use of AI to make decisions (e.g., codes of ethics/responsible design, ethical design consideration and choices, and decision tracking).
18.16	Understand the subjective nature of values across cultures and describe the key principles, importance, and challenges of designing AI to align with the norms and values of the user group in mind (e.g., understanding user's values, culture, and norms; defining the value system the AI system is designed for).
18.17	Describe the expertise and process needed to ethically design AI to support users (e.g., multi-disciplinary team incl. Ethicist/sociologist, developers, legal/compliance, tracking, etc.).
19.0	Identify deep fakes and explain critical Information processing. The student will be able to:
19.01	Distinguish between credible and unreliable information sources.

CTE Standards and Benchmarks
19.02 Recognize and describe signs of compromised information or data.

Florida Department of Education
Student Performance Standards

Course Title: **Applications of Artificial Intelligence**
Course Number: **9401020**
Course Credit: **0.5**

Course Description:

The purpose of this course is to assist students in deepening understanding for application of AI and to explore methods and tools utilized to build AI models. The content includes but is not limited to foundational knowledge and skills related to methods and software used to develop AI applications using data sets. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
20.0	Design and evaluate a perception system and its limits. The student will be able to:
	20.01 Use a software tool such as a speech transcription or visual object recognition demo to demonstrate machine perception.
	20.02 Explain the difference between sensing and perception.
	20.03 Illustrate how sequences of sounds can be recognized as candidate words, even if some sounds are unclear.
	20.04 Illustrate how face detection works by extracting facial features.
	20.05 Illustrate and explain how outlines of partially occluded (blocked) objects in an image differ from the real shapes of the objects and the affects this has on accurate object recognition.
	20.06 Demonstrate how a text to speech system can resolve ambiguity based on context, and how its error rate goes up when given ungrammatical or meaningless inputs.
	20.07 Describe how domain knowledge needs to encompass the diversity of groups an application is intended to serve.
	20.08 Classify a given image and describe the kinds of knowledge a computer needed to understand classifications of this type.
	20.09 Analyze one or more online image datasets and describe the information the datasets provide and how this can be used to extract domain knowledge for a computer vision system.
	20.10 Describe how a vision system might exhibit cultural bias if it lacked knowledge of objects not found in the culture of the people who created it.
	20.11 Describe the technical difficulties in making computer perception systems function well for diverse groups.
21.0	Train and evaluate a range of ML models based on specific accuracy, inclusivity, and ethical design criteria. The student will be able to:

CTE Standards and Benchmarks	
	21.01 Demonstrate how to train a computer to recognize something.
	21.02 Train a classification model using machine learning and examine the accuracy of the model on new inputs.
	21.03 Using software to calculate misclassification rates and comparing classification algorithms/models to decide which is the better based on total misclassification rate.
	21.04 Explain how a goodness of fit measure can be used to quantify the success of the prediction made by the algorithm/model.
	21.05 Train and evaluate a classification or prediction model using machine learning on a tabular dataset.
	21.06 Use a supervised or unsupervised learning algorithm to train a model on real world data, then evaluate the results.
	21.07 Evaluate the accuracy, inclusivity, and ethical design of the model
	21.08 Explore and utilize packages from a data analysis and manipulation tool when training a machine learning model.
	21.09 Utilize visual reporting and statistical tools to perform, understand, and interpret statistics such as regression analysis, ANOVA, hypothesis testing, and sampling distributions.
22.0	Design and evaluate a data set to solve a problem using specific accuracy, inclusivity, ethical design criteria. The student will be able to:
	22.01 Explain the data pipeline including data collection, manipulation, cleansing, and transformation and describe how these can be used to ethically and responsibly improve datasets.
	22.02 Define and explain the difference between training, validation, and test datasets.
	22.03 Define and distinguish between balanced and imbalanced datasets and Identify potential problems with imbalance datasets.
	22.04 Identify different kinds of data and how they might be used in decision making
	22.05 Identify patterns in labeled data and determine the features that predict labels.
	22.06 Demonstrate how supervised learning identifies patterns in labeled data.
	22.07 Demonstrate how unsupervised learning finds patterns in unlabeled data.
	22.08 Create a labeled dataset with explicit features to illustrate how computers can learn to classify things like foods, movies, or toys.
	22.09 Create a labeled dataset to solve a problem and note the range of labels that can be used to describe the dataset depending on the problem and desire solution space.
	22.10 Identify, evaluate, and utilize existing datasets from reliable sources to train machine learning models.
	22.11 Identify bias and ethical factors to consider when evaluating sources of data.
	22.12 Evaluate and discuss the sources of bias in the dataset and use ethical design principles to address the issues.

CTE Standards and Benchmarks	
	22.13 Explain and demonstrate the ways training data influences learning and decisions made by the model.
23.0	Design AI solutions using embedded computing. The student will be able to:
	23.01 Identify and define the function of circuits, sensors, microcontrollers, motors, and other components used in embedded systems.
	23.02 Assemble an embedded or robotic system that use circuits, sensor(s), microcontroller, microcomputers, motor(s) to complete a specific task.
	23.03 Write a program for an embedded or robotic system that makes a decision based on sensor/user input, controls mechanics of the robot, and completes a “human” task (e.g., delivers items, opens a door for someone, solves a puzzle, etc.).
	23.04 Use a problem-solving method to debug hardware issues.
24.0	Explore the characteristics, tasks, work attributes, options, and tools associated with AI-enabled careers. The student will be able to:
	24.01 Explore a variety of careers that leverage AI tools and systems.
	24.02 Discuss the impact of AI on business and commerce.
	24.03 Evaluate the impacts of irresponsible use of AI technologies.
	24.04 Identify tasks performed by AI-enable professionals.
	24.05 Identify and explain the ways businesses use AI to solve business problems.
	24.06 Investigate AI-enabled career opportunities in business, medicine, engineering, construction, science, social services, government, military, computing, education, manufacturing, and finance/banking fields.
	24.07 Explain different specializations and the related training in AI-enabled careers.
	24.08 Explain the need for continuing education and training of AI-enabled professionals.
	24.09 Explain how AI is used in enterprise software systems and how insights from AI impact decision-making.
	24.10 Describe ethical responsibilities of AI-enabled professionals.
	24.11 Identify credentials and certifications that may improve employability for an AI-enabled professional.
	24.12 Identify devices, datasets, tools, and other environments for which AI-enabled professionals may use, modify, and develop AI systems
	24.13 Students learn that people in various work roles engage in continuous learning to upgrade skills and adapt to change
	24.14 Students execute projects that demand critical and creative thinking, planning and problem-solving using research and investigation skills

CTE Standards and Benchmarks	
	24.15 Students learn that people in various work roles engage in continuous learning to upgrade skills and adapt to change
25.0	Identify how leadership development, school and community service projects and competitive events are integral parts of career and technology education. The student will be able to:
	25.01 Explain the goals, mission, and objectives of the career-technical student organization (CTSO).
	25.02 Explore the impact and opportunities a student organization can develop to bring business and education together in a positive working relationship through innovative leadership and career development programs.
	25.03 Explore the local, state, and national opportunities available to students through participation in related student organization including but not limited to conferences, competitions, community service, philanthropy, and other CTSO activities.
	25.04 Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.
	25.05 Explore the competitive events related to the content of this course and the required competencies, skills, and knowledge for each related event for individual, team, and chapter competitions.
	25.06 Students learn that learning can occur in both formal and informal environments and seek opportunities outside of school.
	25.07 Express a positive attitude towards lifelong learning and how it relates to various careers.
	25.08 Students begin to familiarize themselves with and adopt professional qualities such as self-management, agency, self-efficacy, initiative and enterprise.
	25.09 Students learn that people in various work roles engage in continuous learning to upgrade skills and adapt to change.
	25.10 Students execute projects that demand critical and creative thinking, planning and problem-solving using research and investigation skills.
26.0	Use appropriate tools to design an AI System to solve problems. The student will be able to:
	26.01 Select a dataset that is appropriate for a given AI application.
	26.02 Curate and clean a dataset for use.
	26.03 Employ one or more technological tools such as data science, machine learning, natural language processing, neural networks, decision-tree, signal procession, computer vision, and facial recognition to expedite workflow.
	26.04 Provide examples of how AI can inform and drive decision-making and automatization.
	26.05 Use an ethical development process to create, analyze and iterate an AI-enabled solution, individually and collaboratively.
	26.06 Distinguish between the range of tools and services available for AI-enabled professionals and AI experts/developers/engineers.
	26.07 Determine the computing resources (e.g., desktop vs GPU) and time needed (e.g., minutes, hours, days, weeks) to complete a ML/AI task.
	26.08 Identify and research networks and cloud services that use AI solutions (Neural Networks, data management, different industry-

CTE Standards and Benchmarks	
	specific solutions and services, Edge AI).
	26.09 Identify AI in a variety of industry solutions and services and make appropriate recommendations of AI applications based on an industry need.
	26.10 Define and identify and use basic functions of proprietary AI tools.
27.0	Characterize important issues related to privacy and security in the development and use of AI-enable technologies. The student will be able to:
	27.01 Identify and debate the range of views on government regulation of AI usage due to concerns such as privacy, ethics, and security.
	27.02 Identify AI and ethics-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
	27.03 Identify the methods/techniques for collecting data from people and explain the privacy and security risks to people for whom data is collected for use in training machine learning models.
	27.04 Discuss security and privacy issues that relate to networked AI Applications.
	27.05 Explain and demonstrate how training data influences learning.
28.0	Explain the key technical challenges in design and responsible use of AI technologies. The student will be able to:
	28.01 Explain and demonstrate how training data influences learning
	28.02 Explain how developing an AI application involves humans making numerous technical and ethical decisions
	28.03 Explain the current issues with explainability of decisions made with neural networks and other deep learning architectures
	28.04 Explore the challenges of using explainable AI (e.g., cost, ability to develop solutions when issues are discovered)
29.0	Set up and use a ML pipeline to solve a problem. The student will be able to:
	29.01 Identify problem that can be solved with ML.
	29.02 Use appropriate techniques and best practices for selection, collection, and/or curation of data to gain insight on a problem.
	29.03 Use appropriate techniques and best practices for selection of algorithms and architectures to develop and train a model to solve a problem.
	29.04 Use of appropriate tools to evaluate the quality and accuracy of the model.
	29.05 Use of appropriate tools and techniques to deploy and use model.
	29.06 Evaluate the important issues related to privacy and security in the development and use of ML models

CTE Standards and Benchmarks	
	29.07 Demonstrate awareness of the issues that arise in model use (e.g., model degradation) and best practices for maintaining the accuracy of deployed models.
	29.08 Demonstrate an awareness that training a machine learning model is an iterative process that requires time and compute resources.
30.0	Appropriately use automated AI services to accomplish common tasks. The student will be able to:
	30.01 Train a ML model and deploy a model as a service.
	30.02 Select and use of appropriate techniques for setting up a workspace, create computing resource, and exploring data.
	30.03 Create and run a training pipeline, evaluate a regression model, create an inference pipeline, deploy a predictive service.
	30.04 Selection and use of appropriate AI services to create a regression model that predicts numeric values.
	30.05 Selection and use of appropriate AI services to create a clustering model that groups similar entities based on their features.
	30.06 Selection and use of appropriate AI services to create a classification model that predict categories or classes.
	30.07 Selection and use of appropriate AI services to detect and analyze faces.
	30.08 Selection and use of appropriate AI services to analyze and classify images.
	30.09 Selection and use of appropriate AI services to detect objects in images.
	30.10 Selection and use of appropriate AI services to read and analyze text.
	30.11 Selection and use of appropriate AI services to recognize and synthesize speech.
	30.12 Selection and use of appropriate AI services to translate.
	30.13 Selection and use of appropriate AI services to create a language model with language understanding.
	30.14 Selection and use of appropriate AI services to build a QnA or language understanding bot.
31.0	Explain and use design thinking to solve a problem. The student will be able to:
	31.01 Distinguish between social and personal problems to be solved through a design.
	31.02 Identify a challenge of social importance and personal interest.
	31.03 Students develop problem statements embedded within a complex challenge.
	31.04 Understanding challenges and user needs more deeply.

CTE Standards and Benchmarks	
	31.05 Pattern and sort user data to define design challenges.
	31.06 Use a formal brainstorming process to generate ideas.
	31.07 Test and iterate prototypes.
	31.08 Refine prototypes based on user feedback.
	31.09 Create stakeholder maps.
	31.10 Develop point-of-view statements for users.
	31.11 Develop a blueprint for a prototype.
	31.12 Gather feedback from users.
	31.13 Revise prototypes and present rationale for final design.
32.0	Show how a system is composed and interacts and be able to express verbally, graphically and in writing how the system functions. The student will be able to:
	32.01 Recognize and define components of an AI system.
	32.02 Determine the purpose and function of different systems.
	32.03 Draw arrows showing how one part interacts with other parts. Students tell a story about the interactions between parts of a system (in writing and verbally).
	32.04 Observe and analyze different systems that have the same outcome (for example, how one class transitions from reading to lunch compared to another class).
	32.05 Apply multiple literacies (data, information, historical, etc) to identify and understand problems; ask appropriate questions; and design an appropriate solution.
	32.06 Reflect on cause and effect within an observed system.
	32.07 Recognize relationships between variables in a system (feedback loops, interactions between human and physical environment, different information sources related to the same problem).
	32.08 Complete a systems map demonstrating interrelationships between components of a system.
	32.09 Select, observe, and improve a specific component of a system.
	32.10 Conduct interviews and use empathy to understand the role of specific stakeholders within a system.
33.0	Understand and interpret different types of data. The student will be able to:

CTE Standards and Benchmarks	
	33.01 Observe and measure differences between objects, (qualitative or quantitative) and uses charts/graphs to illustrate differences.
	33.02 Understand and explain how information can be collected, used, and presented.
	33.03 Recognize and understand data in various forms including charts, graphs, text, etc.
	33.04 Identify and understand the roles of databases in everyday life.
34.0	Understand how data is accessed, sorted, and stored. The student will be able to:
	34.01 Explain the role that computers play in storing and accessing data.
	34.02 Describe databases and how they organize and transform data.
	34.03 Understand data sets with multiple categories/arranged in scaled graphs (one bar represents 5 items).
	34.04 Collect, organize, manipulate, and transform data, and identify databases.
	34.05 Create a model and use data from a simulation.
	34.06 Understand and show ability to represent and manipulate data/data bases.
	34.07 Explain how computing devices represent and manipulate information.
	34.08 Create, modify, and manipulate databases.
35.0	Generate and tell stories with data. The student will be able to:
	35.01 Collect, organize, and arrange data into charts/graphs.
	35.02 Identify structural components of data representations (e.g., axes on a graph, table rows and columns, scale on a geographic map, key on a color map.
	35.03 Organize data and tell the data story presented in simple charts and graphs.
	35.04 Interpret and explain more complex charts that record more variables.
	35.05 Decode data: Identify and extract measurements, values or data points and what they represent from graphs, tables, or other data representations.
	35.06 Identify structural components of data representations (e.g., axes on a graph, table rows and columns, scale on a geographic map, key on a color map.
	35.07 Identify most appropriate visualization for a given data set.
36.0	Think critically about data. The student will be able to:

CTE Standards and Benchmarks	
36.01	Understand and explain how data changes over time; (e.g., weather through seasons).
36.02	Analyze information and derive conclusions based on data presented.
36.03	Show ability to interpret and make predictions based on data that changes over time.
36.04	Interpret data representations accurately; identify potential bias and missing data; accurately connect position statements with data sets that support them.
36.05	Decode, analyze and interpret data describing meaningful patterns, separate factual information from inferences.
36.06	Analyze and interpret data and identify and describe meaningful patterns in data.
36.07	Make quantitative and qualitative comparisons of data; communicate scientific information/tell a story with data.
36.08	Separate factual information from inferences,
36.09	Use data, math, and statistics to develop and/or support claims that address specific scientific questions.

Florida Department of Education
Student Performance Standards

Course Title: **Intermediate Programming**
Course Number: **9007220**
Course Credit: **1**

Course Description:

This course continues the study of computer programming concepts with a focus on the creation of software applications employing procedural programming techniques.

CTE Standards and Benchmarks	
37.0	Design a computer program to meet specific physical, operational and interaction criteria. The student will be able to:
37.01	Choose appropriate data types depending on the needs of the program.
37.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
37.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
37.04	Compare techniques for analyzing massive data collections.
37.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
37.06	Create mobile computing applications and/or dynamic webpages using a variety of design and development tools, programming languages and mobile devices/emulators.
37.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
37.08	Identify the tools required to develop a program *(*e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
38.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
38.01	Use appropriate naming conventions to define program variables and methods.
38.02	Use a program editor to write the source code for a program.
38.03	Write programs that use selection structures.
38.04	Write programs that use repetition structures.

CTE Standards and Benchmarks	
	38.05 Write programs that use nested structures.
	38.06 Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.
	38.07 Compile, run, test and debug programs.
	38.08 Write programs that use standard arithmetic operators with different numerical data types.
	38.09 Write programs that use standard logic operators.
	38.10 Write programs that use a variety of common data types.
	38.11 Write programs that perform data conversion between standard data types.
	38.12 Write programs that define, use, search, and sort arrays.
	38.13 Write programs that use user-defined data types.
	38.14 Demonstrate understanding and use of appropriate variable scope.
	38.15 Use global and local scope appropriately in program implementation.
	38.16 Distinguish between binary and sequential searches.
39.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	39.01 Determine the results of code segments.
	39.02 Write programs that perform user input and output.
	39.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	39.04 Write program modules such as functions, subroutines, or methods.
	39.05 Write program modules that accept arguments.
	39.06 Write program modules that return values.
	39.07 Write program modules that validate arguments and return error codes.
	39.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	39.09 Use APIs and libraries to facilitate programming solutions.

CTE Standards and Benchmarks	
	39.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
	39.11 Explain how abstraction manages complexity.
40.0	Effectively communicate and collaborate. The student will be able to:
	40.01 Evaluate modes of communication and collaboration.
	40.02 Select appropriate tools within a project environment to communicate with project team members.
	40.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project.
	40.04 Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
	40.05 Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
	40.06 Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
41.0	Demonstrate responsible use of technology and information. The student will be able to:
	41.01 Implement an encryption, digital signature, or authentication method.
	41.02 Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people (e.g., phishing, keylogging, virus, malware, intercepting data over public networks).
	41.03 Identify and explain the existence of biases in computer programming.
	41.04 Explain how computing can play a role in social and political issues.
42.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:
	42.01 Differentiate between multiple levels of operating system, translation, and interpretation that support program execution.
	42.02 Explain the program execution process (by an interpreter and in CPU hardware).
	42.03 Describe object-oriented concepts.
	42.04 Explain the characteristics of procedural and object-oriented programming languages
	42.05 Compare and contrast programming languages that are compiled, interpreted, and translated.

Florida Department of Education
Student Performance Standards

Course Title: **Foundations of Machine Learning**
Course Number: **9401040**
Course Credit: **1**

Course Description:

The purpose of this course is to provide students with core foundational knowledge to deepen understanding of machine learning (ML) practices and applications. This course builds understanding of the mathematical foundation needed to create algorithms for use in artificial intelligence and machine learning. The content includes but is not limited to foundational knowledge and skills related to computer coding and software development. Instruction and learning activities are provided in a laboratory setting using hands-on experiences with the equipment, materials and technology appropriate to the course content and in accordance with current practices.

CTE Standards and Benchmarks	
43.0	Explain the nature of representations and their importance in AI. The student will be able to:
43.01	Identify examples of abstractions used in everyday life, describe the characteristics of abstractions, and explain how they are different than their real-world counterparts.
43.02	Describe the two major types of knowledge representations (i.e., symboli and numerical representations), identify examples of each type, and explain when each is used in AI solutions.
43.03	Explain how and when data structures (e.g., trees, graphs, arrays, schema) are used to represent data in AI (e.g., search trees, decision trees, maps, 1D Arrays -feature vectors. 2D-Arrays – tables, matrices).
43.04	Construct a representation of data, game, map, or real-world object/scenario/problem using a data structure (e.g., graph – map or game board, tree – classification and moves in a game, array – feature vector, schema – description of a concept), identify the parts of the representation and explain how to reason with them.
43.05	Evaluate and use the appropriate data structure for programming a specific machine learning algorithm.
43.06	Explain how representations work with reasoning to solve problems.
43.07	Research the different kinds of symbolic representations used to encode information about the world (e.g., symbols, relationships, properties, etc.) in ways a computer can reason with to solve complex tasks (i.e., diagnosing a medical condition or having a dialog in a natural language).
43.08	Construct a feature vector representation for a set of objects or word embeddings and explain how distance is used to determine the similarity and difference between objects or words in the feature space.
44.0	Use search algorithms to reason with symbolic representations. The student will be able to:
44.01	Identify types of real-world problems that are search problems and describe their states and operators.

CTE Standards and Benchmarks	
	44.02 Illustrate how a computer can represent the playing of a game (e.g., tic-tac-toe) by drawing the sequence of board positions produced by the players' moves.
	44.03 Describe the search space for graph and tree search algorithms and explain legal and illegal moves.
	44.04 Model the process of solving a graph search problem (e.g., games, mazes, maps, reason about concepts) using breadth-first, depth-first, and best-first search to draw a search tree.
	44.05 Compare and contrast the advantages and disadvantages (e.g., cost, space, time complexity) of using breadth-first, depth-first, and best-first search to solve a problem.
45.0	Explain the relationship between representation and reasoning. The student will be able to:
	45.01 Describe the ways in which AI uses computer science concepts such as data structures (representations) and algorithms (reasoning methods) to solve problems.
	45.02 Describe the mutual dependence between representation and reasoning-representations support reasoning; reasoning methods operate on representations.
	45.03 Describe how reasoning with symbolic representations is performed using logical inference rules.
	45.04 Describe how reasoning with numerical representations utilizes complex mathematical functions such as neural networks.
46.0	Explain the nature of machine learning. The student will be able to:
	46.01 Define machine learning as a set of techniques (algorithms) that allow a computer to learn behaviors without explicit programming.
	46.02 Explain that machine learning algorithms are learning "patterns" in data to construct internal representations that encode the relationship between inputs and outputs and result in a model for reasoning (e.g., reasoner).
	46.03 Model and explain how machines learn new behaviors due to changes/adjustments the learning algorithm makes to internal representations of a decision tree or a neural network reasoning model.
	46.04 Illustrate and compare how supervised, unsupervised, and reinforcement learning algorithms adjust internal representations to learn for classification or prediction.
	46.05 Explain the similarities and differences between how humans and machine learning algorithms learn.
47.0	Use and evaluate supervised learning techniques to classify or predict outputs. The student will be able to:
	47.01 Research and present real-world problems and applications of supervised learning.
	47.02 Describe how supervised learning algorithms find relationships between feature values and class labels in labeled data to create classification or prediction models.
	47.03 Explain how supervised learning models use features to predict or label new data.
	47.04 Describe how supervised learning algorithms adjust the parameters of a mathematical model (selected in advance by a human) to create models that make correct classifications or predictions.

CTE Standards and Benchmarks	
	47.05 Evaluate the results of a supervised learning model by measuring the percent of items in a test set that are labeled correctly.
	47.06 Describe the types of algorithms that are used for classification (e.g., decision trees, NN, logistic regression).
	47.07 Describe the types of algorithms that are used for regression (e.g., decision trees, NN, linear regression).
	47.08 Evaluate the accuracy of a classification model using root mean squared error.
	47.09 Describe the benefits and limitations of supervised learning algorithms for solving problems.
48.0	Use and evaluate unsupervised learning techniques to solve problems. The student will be able to:
	48.01 Research and present real-world problems and applications of unsupervised learning (e.g., anomaly detection in fraud and medical images, groups of customers who buy similar products, recommender systems).
	48.02 Describe how an unsupervised learning algorithm finds patterns in unlabeled data by looking for data grouped into clusters.
	48.03 Explain how an unsupervised learning model is trained to assign each input to a cluster of similar inputs.
	48.04 Explain how unsupervised learning differs from supervised learning and how this difference allows unsupervised learning algorithms to solve more complex problems than supervised learning algorithms.
	48.05 Distinguish between data that are appropriate for supervised versus unsupervised learning based on its structure, particularly the presence and roles of inputs and outputs.
	48.06 Explain how clustering works and the types of problem clustering algorithms solve.
	48.07 Use clustering algorithms (e.g., K-Means, hierarchical clustering, principal component analysis) to solve a problem.
	48.08 Use an unsupervised learning algorithm to generate a decision tree to predict numerical outcomes using 1 or 2 features/variables. Fit and interpret a regression tree using software.
	48.09 Evaluate the results of an unsupervised learning model by examining the clusters to see if they capture useful distinctions in the dataset (e.g., If the clustering algorithm separates dissimilar observations apart and similar observations together, then it has performed well).
	48.10 Describe the limitations of clustering algorithms (e.g., identification of clusters even if the data does not contain any clusters, unable to understand why elements are clustered together).
49.0	Use and evaluate reinforcement learning techniques to solve problems. The student will be able to:
	49.01 Research and present real-world problems and applications of reinforcement learning (e.g., self-driving cars, walking, learning a new skill, video games, question answering, machine translation, medical diagnosis, sequential decision-making problems).
	49.02 Explain that reinforcement learning models focus on how machines can learn to act in a particular way (e.g., robots learning to walk, or chatbots learning to better answer customer problems).
	49.03 Describe how reinforcement learning generally works: the learning algorithm uses trial and error to find a policy for choosing actions that maximizes the reinforcement signal.

CTE Standards and Benchmarks	
	49.04 Model the ways that reinforcement learners update value predictions or policies (e.g., internal representations).
	49.05 Use reinforcement algorithms to solve a problem (e.g., Deep Adversarial Networks, Q-learning).
	49.06 Describe the benefits and limitations of reinforcement learning.
50.0	Use and evaluate different types of neural network architectures and their applications. The student will be able to:
	50.01 Illustrate the two main components of a Generative Adversarial Network's (GAN) architecture (i.e., generator and discriminator models) and explain how each component works to create realistic images and audio.
	50.02 Illustrate the architecture of a convolutional neural network (CNN) and explain the motivation for the model and how it is optimized for computer vision tasks (e.g., image processing, natural language processing, and recommendation systems).
	50.03 Illustrate the architecture of a recurrent neural network (RNN) and explain how it is optimized for time-series forecasting (e.g., weather prediction, stock predictions, etc.).
	50.04 Describe the purpose of ensemble learning methods and how they are used to improve the performance of machine learning models and identify examples in the real-world.
	50.05 Describe the purpose of transfer learning methods and how it is used to decrease the amount of training time for new tasks and identify examples in the real-world.
51.0	Illustrate Neural Networks and their components. The student will be able to:
	51.01 Describe and illustrate the fundamental components of a neural network (e.g., input, hidden layers, output) and their purpose.
	51.02 Explain the roles hyperparameters, activation functions, learning rules, and transfer functions play in the development of a machine learning model.
	51.03 Illustrate and explain how backpropagation works to improve how machines learn.
	51.04 Illustrate and explain how stochastic gradient descent works.
	51.05 Research and explain how deep neural networks work.
	51.06 Illustrate and explain how Feedforward multi-layer work.
	51.07 Illustrate and explain how a perceptron work.
52.0	Recognize and identify mathematical principles upon which machine learning and AI are built such as calculus, linear algebra, probability, statistics, and optimization partial derivatives. The student will be able to:
	52.01 Explain how machine learning uses statistics to find patterns in data to make predictions about future values, identify the relationship between features, and make improvements.
	52.02 Identify the type of mathematical functions machine learning models use (e.g., a simple linear equation, a high-degree polynomial, or an even more complex nonlinear equation such as a deep neural network).
	52.03 Recognize that neural networks are non-convex functions composed of many multi-variable functions.

CTE Standards and Benchmarks	
52.04	Illustrate and explain the role of gradient based algorithms for training neural networks and related issues.
52.05	Use a linear regression model and then adjust its parameters to fit a set of data points and use the model to predict a y value for any x value.
52.06	Model polynomial or logistic regression by using tools to manually adjust the parameters to reach what they perceive as a best fit to the data.
52.07	Evaluate the quality of fit of a machine learning model using the mean squared error to determine if they have been over-fitted or under-fitted and explain the implications for future predictions or classifications made by the model.
52.08	Utilize visual reporting and statistical tools to perform, understand, and interpret statistics such as regression analysis, ANOVA, hypothesis testing, and sampling distributions.
53.0	Use the most common machine learning algorithms to solve a problem. The student will be able to:
53.01	Construct a decision tree to solve a classification or prediction problem and explain the pros and cons of using this approach to solve the problem.
53.02	Construct a neural network to solve a classification or prediction problem and explain the pros and cons of using this approach to solve the problem.
53.03	Construct a linear regression model to predict a time-series value and explain the pros and cons of using this approach to solve the problem.
53.04	Use K nearest neighbor algorithm to solve classification and regression problems and explain the pros and cons of using this approach to solve the problem.
53.05	Construct machine learning using a naïve Bayes algorithm to solve a classification problem and explain the pros and cons of using this approach to solve the problem.
53.06	Construct machine learning using support vector machines (SVM) algorithm to solve a classification or regression problem and explain the pros and cons of using this approach to solve the problem.
54.0	Identify the types of problems that can be solved with machine learning algorithms. The student will be able to:
54.01	Describe the kinds of reasoning problems machine learning algorithms can solve (e.g., classification, prediction, sequential decision making, regression, search, heuristic search, logical deduction, statistical inference).
54.02	Categorize real-world problems as classification, prediction, sequential decision problems, combinatorial search, heuristic search, adversarial search, logical deduction, or statistical inference.
54.03	Describe the kinds of reasoning problems and the machine learning algorithms that can be used to solve them (e.g., supervised learning, used for classification and prediction; unsupervised learning, used for clustering; and reinforcement learning, used for sequential decision making.
54.04	Select the appropriate type of machine learning algorithm (supervised, unsupervised, or reinforcement learning) to solve a reasoning problem and explain why this algorithm is most appropriate for this type of problem.
54.05	Evaluate the pros and cons between two approaches to solving a reasoning problem (e.g., decision tree vs visual classifier).
55.0	Evaluate the sources of bias in machine learning/AI and identify appropriate mitigation strategies. The student will be able to:

CTE Standards and Benchmarks	
55.01	Recognize that machine learning models and AI systems are inherently socio-technical system that have requirements spanning hardware, software, personal, and community aspects. Thus, an incident in a socio-technical system is not just a technical problem but also a social problem between humans that requires coordination.
55.02	Examine the role and importance of taking a human-in-the-loop approach to the training of machine learning models and deployment and use of AI-driven automation of systems.
55.03	Identify the critical points of machine learning model and AI system design (e.g., goals, purposes, and risks) that are not easily identified by automation itself and require human-in-the-loop decision making.
55.04	Identify and address bias in the machine learning and AI system development lifecycle.
55.05	Evaluate flaws in the model of the world due to sample bias, prejudicial bias, and measurement bias.
55.06	Examine the ways in which biases and preferences of those who are designing, building, or testing the system may contribute to the systems behaviors or decisions.
55.07	Evaluate how the system is used in decision making and by whom.
55.08	Evaluate the role the motivation and purpose for the system or model to be developed influences the system design and behavior.
55.09	Research proxies in data for race, ethnicity, socio-economic status, gender, or context that can lead to disparate accuracy and impacts on different people groups.
55.10	Identify characteristics that indicate a problem is framed in a fundamentally problematic way.
55.11	Determine whether characteristics of dataset (e.g., incomplete, imbalance, and selected inappropriately) are contributing bias to a machine learning model.
55.12	Evaluate machine learning model for characteristics of measurement bias as a result from faulty measurement (e.g., sources sensors such as camera color filters and distance, data collection instruments, data labeling).
55.13	Argue for and against the accuracy of the claim that AI can produce more fair results than human.
55.14	Recognize the many roles that humans play in development of AI models, algorithms, data collection and preparation, model training and use, and decision making.
55.15	Investigate the ways that prejudice and stereotyping can make their way into data and strategies for mitigating prejudicial bias.
55.16	Evaluate the goals and acceptable behavior of a particular AI application.
55.17	Research the ethical, security, and privacy issues that affect data gathering and quality that can contribute to bias in a model.
55.18	Explain the need for models to be regularly evaluated and updated to best represent the model of current world.
55.19	Explain the concerns that designers and users of AI systems should have AI is being used in context where there is no objective answer.
55.20	Explain how accuracy and impact of algorithms cause algorithmic bias.

CTE Standards and Benchmarks	
56.0	Program machine learning algorithms to train a model on real world data, then evaluate the results. The student will be able to:
56.01	Identify real world data sets that are appropriate to solve a problem of interest.
56.02	Use either a supervised or unsupervised learning algorithm to train a model on real world data, then evaluate the results.
56.03	Quantitatively measure the performance of a trained model on a nontrivial test set.
56.04	Learning an assortment of machine learning algorithms and understand how to implement them in real-world scenarios.
56.05	Explain the importance of considering the nature of your dataset when deciding which algorithm to use.
56.06	Explain and model the use of a cross-validation data sets to evaluate the best model for a problem that avoids overfitting and under-fitting.
56.07	Describe the role of training data in determining the accuracy and margin of error of the model
56.08	Evaluate the bias-variance trade-off as an estimation of error of a model and explain the implications for future predictions or classifications made by the model.
57.0	Identify different kinds of data, sources, and how they might be used in decision making. The student will be able to:
57.01	Explain why data is the fuel of machine learning and the importance of quality data for gaining insights.
57.02	Identify and describe sources of company data such as basic information (search trends), economic information, technology information (e.g., website traffic and trends), and reviews-based information (e.g., business rating and reviews).
57.03	Identify and describe sources of people data such as Internet behavior: web presence score, social networks and social mentions, search engine results, proxy usage, economic information, interests and, spending.
57.04	Identify and describe sources of geospatial data such as location-specific alternative data such as demographic information, property information, purchasing behavior, business information.
57.05	Identify and describe sources of time-based data such as real-time information surrounding events, politics, internet trends behavior (e.g., trending keywords and subjects, foot traffic, web traffic), and financial trends: Company share price, GDP, debt history, unemployment trends.).
57.06	Explain how different kinds of data can be used in decision-making and the form/type (text, numerical, time series, image, categorical) data may be represented in.
58.0	Explain the characteristics, collection, storage, and uses of datasets in AI. The student will be able to:
58.01	Explain the relationship between the size of a data set needed and the type of problem it is trying to solve.
58.02	Identify and utilize existing datasets from reliable sources (e.g., Kaggle) to train machine learning models.
58.03	Collect data from APIs, RSSs, and web scraping

CTE Standards and Benchmarks	
	58.04 Use SQL and NoSQL databases to store and retrieve data and to work with large datasets
	58.05 Explore data wrangling methods such as data inspection and cleaning to prepare data for processing.
	58.06 Use excel or spreadsheet software to view, organize, filter, and clean or separate data.
	58.07 Use programming tools and processes to clean and transform data (e.g., Pandas, Spark, Dask, SQL, Spark SQL, and/or ScrappingHub).
	58.08 Develop an understanding of data management issues in the context of the data science learning cycle.
59.0	Work with datasets to gain insight, using data analysis and visualization tools. The student will be able to:
	59.01 Use good practices for statistical sampling and testing and incorporation of uncertainties in estimation using margins of error or interval estimates to accurately analyze data.
	59.02 Uses statistics to find patterns in data and create a computer algorithm that improves the more it is implemented.
	59.03 Use data analysis techniques to useful discover new or information, guide decision-making, power an application, or be used to tell a story.
	59.04 Explore and utilize packages from a data analysis and manipulation tool when training a machine learning model (e.g., Pandas).
	59.05 Use basic techniques for exploration and analysis of single, pair, and multi-feature models.
	59.06 Build a ML model based on a dataset that trains the computer on how to make decisions.
	59.07 Tell a data story using appropriate visualizations that are clear, compelling and accessible for the audience (e.g., interactive dashboards, static infographics, charts, graphs, etc.).
60.0	Critique data and data-based claims to avoid being misled by data through identifying bias, confounding and random error. The student will be able to:
	60.01 Provide examples of the social and personal consequences of predictions derived from models built on data.
	60.02 Identify and describe errors in decisions and predictions owing to faulty use of data.
	60.03 Describe issues of privacy and security with respect to data collection, storage, analysis, and insights.
	60.04 Discuss how and when data can support making decisions.
61.0	Apply the machine learning life cycle in the development and use of a machine learning model. The student will be able to:
	61.01 Identify a problem to solve and write a problem definition.
	61.02 Evaluate the problem and identify the data needed to solve the problem.

CTE Standards and Benchmarks	
	61.03 Find, convert, clean, and prepare the data for use in constructing a machine learning model.
	61.04 Evaluate, select, and test an appropriate model using the hold-out dataset method.
	61.05 Select and justify the appropriateness of the learning algorithm for your problem and data.
	61.06 Experiment by adjusting hyper-parameters to tune the model.
	61.07 Use a cross-validation set to determine when training should stop to avoid overfitting.
	61.08 Use a test set to measure performance of the machine learning model.
	61.09 Evaluating success of model: setting criteria, what to do when it fails in lab; fails in field. This can be done by an independent group for high-stakes applications.
	61.10 Use appropriate tools to deploy and use the machine learning model.
	61.11 Monitor model use over a span to time to evaluate its effectiveness on unseen data and make improvements.
62.0	Design and develop AI systems to solve a problem or design solutions for social and ethical issues. The student will be able to:
	62.01 Define and research a real social or ethical problem in the community that could be enhanced or solved with AI.
	62.02 Use a problem-solving process (e.g., design thinking) to collaboratively investigate the identified problem and identify requirements.
	62.03 Analyze the requirements and translate the vision to build complete end-to-end AI solutions.
	62.04 Define and apply a team-based software development process to collaboratively design a solution that uses AI for the problem.
	62.05 Identify and use IDEs, APIs, and packages in program development to build and train machine learning models.
	62.06 Design and develop an AI software solution that addresses a researched interest or problem that could be enhanced or solved with AI.
63.0	Understand how machine learning is applied to solve problems. The student will be able to:
	63.01 Name common computer vision tasks (e.g., image classification, object detection, semantic segmentation, image analysis, face detection, analysis, and recognition; optical character recognition (OCR)) and how they might be used to solve problems.
	63.02 Understand the ways natural language processing can be used to create software to solve a wide range of problems related to written and spoken language.
	63.03 Research the current applications of machine learning in innovations in science, medicine, healthcare, banking and investment, engineering, building and construction, education, and criminal justice.
	63.04 Evaluate an AI systems and identify all the forms of machine learning or AI sub-systems contribute to the systems behavior(s).

CTE Standards and Benchmarks	
64.0	Describe the limitations of machine learning and the decisions that can be made with data. The student will be able to:
64.01	Describe the principle of garbage in/garbage out in relationship to data used to train and evaluate the machine learning model and its accuracy and impact.
64.02	Demonstrate and understanding of the inverse relationship between model complexity and transparency and the impact this has on decision making.
64.03	Research and evaluate the limitations of machine learning and AI and the impact this has on decision-making with AI.
64.04	Research the security vulnerabilities of a machine learning model and ways to mitigate them.
64.05	Research the potential failure modes of AI and evaluate how, when, and why things can go wrong.
64.06	Research and evaluate the sensitivity of machine learning models to understand how and why it is likely to break.
65.0	Evaluate societal impacts of AI on individuals, society, and the environment. The student will be able to:
65.01	Explain the implications of Amara's Law in our ability to, which observes that we over-estimate the impact of any given technology in the short term, and under-estimate it in the long term.
65.02	Evaluate the beneficial and harmful effects of AI and machine learning on the environment.
65.03	Evaluate all the ways that you interact with AI directly and indirectly (e.g., use AI-enable system, contribute data to a dataset, trade privacy and security for access to an AI-tool).
65.04	Research and identify the different ways AI impacts individuals, people groups, and communities in different ways.
65.05	Research and identify the policies and laws companies and government adhere to when developing and using AI systems.
65.06	Research and identify the characteristics of jobs/careers that are created and eliminated by AI.
65.07	Research and evaluate the need for continuing education for all careers and age groups impacted by AI.
65.08	Research and evaluate the security issues relevant to machine learning model creation, storage, and usage.
65.09	Research and evaluate the privacy issues relevant to machine learning model creation, storage, and usage.
65.10	Research and illustrate the potential harms and benefits of a specific machine learning model or AI system.
66.0	Evaluate AI applications to ensure they provide solutions to difficult problems without any unintended negative consequences. The student will be able to:
66.01	Use machine learning tools to evaluate the level of fairness a machine learning model has by quantifying the extent to which each feature of the data influences the model's prediction.
66.02	Research and explain the importance of reliability and safety metrics and procedures used in evaluating the level of risk an AI system may pose to human life.

CTE Standards and Benchmarks	
	66.03 Research and evaluate the security issues relevant to machine learning model creation, storage, and usage.
	66.04 Evaluate the level of Inclusiveness an AI system demonstrates through investigating the degree to which it empowers and engages people, and bring benefits to all parts of society, regardless of physical ability, gender, sexual orientation, ethnicity, or other factors.
	66.05 Evaluate the level of transparency an AI system demonstrates through investigating the degree to which users are made fully aware of the purpose of the system, how it works, and what limitations may be expected.
	66.06 Research and identify the strategies individuals, companies, and governments use to demonstrate accountability in AI.
67.0	Research and explain the advancements in computing hardware that make AI possible. The student will be able to:
	67.01 Explain the original purpose of Graphical Processing Units (GPUs) and their role in advancing the field of deep learning.
	67.02 Explain the purpose and function of GPUs in decreasing the training time of machine learning and identify applications that use this approach in the real world.
	67.03 Explain the purpose and function of Tensor Processing Unit (TPU) as an AI accelerator application-specific integrated circuit (ASIC) for neural network machine learning and identify applications that use this approach in the real world.
	67.04 Explain why CPUs are not sufficient for training most machine learning models.
	67.05 Compare and contrast the pros and cons of using GPUs, TPUs, and FPGAs in data processing and performance improvements of AI-based applications.
68.0	Create a portfolio of AI projects that demonstrate the ability to program machine learning models using a wide range of AI algorithms. The student will be able to:
	68.01 Identify common vendors and range of AI, cognitive services, machine learning, and knowledge mining available to architect and implement AI systems involving natural language processing, speech, computer vision, and conversational AI.
	68.02 Analyze requirements for AI solutions, recommending the appropriate tools and technologies to solve a problem.
	68.03 Develop and explain the development process and architecture of a chatbot.
	68.04 Develop and explain the development process and architecture of a recommender system.
	68.05 Develop and explain the development process and architecture of an application that uses natural language processing.
	68.06 Develop and explain the development process and architecture of an application that uses computer vison.
	68.07 Use regression modeling with linear and logistical regression to make a time series prediction model.
	68.08 Use naive bayes, k-nearest neighbor, and support vector machines to develop a classification model.
	68.09 Use random forest and the accompanying boosting algorithms such as XGBoost and CatBoost to develop a Decision tree model.
	68.10 Use isolated forests, PCA or K-Means clustering to develop an Anomaly detection model.

CTE Standards and Benchmarks	
68.11	Demonstrate the ability to use regularization, dimension reduction, and cross-validation in the processes of model selection, evaluation, and interpretation.
68.12	Engage in continuous learning to upgrade skills and adapt to change to complete portfolio projects.
68.13	Execute projects that demand critical and creative thinking, planning and problem-solving using research and investigation skills.
68.14	Apply multiple literacies (data, information, historical, etc.) to identify and understand problems; ask appropriate questions; and design an appropriate solution.
68.15	Explain the usefulness of the AI models they create to a wide range of stakeholders.
69.0	Research and evaluate various AI careers involved in AI system usage, design, development, deployment, and maintenance. The student will be able to:
69.01	Explain the roles, responsibilities, tools, skills, expertise, and education needed for AI researchers to develop new machine learning algorithms, architectures, applications, and approaches to solve challenging problems.
69.02	Explain the roles, responsibilities, tools, skills, expertise, and education needed for AI or machine learning engineers to architect and implement AI algorithms, models, and systems.
69.03	Explain the roles, responsibilities, tools, skills, expertise, and education needed for AI solutions architect to design AI systems that meet the business needs for customers.
69.04	Explain the tools, skills, expertise, and education needed for data scientists to train machine learning models that can make predictions and inferences based on the relationships they find in the data.
69.05	Explain the roles, responsibilities, tools, skills, expertise, and education needed for data engineers to design and implement the management, monitoring, security, and privacy of data solutions.
69.06	Explain the roles, responsibilities, tools, skills, expertise, and education needed for database administrators to implement and manage cloud and on premises databases that work with AI-base data services.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading, and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences, and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Artificial Intelligence Practitioner**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511010200
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Applied Artificial Intelligence AS degree program (1511010200).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to technical knowledge of artificial intelligence (AI) tools and their real-world applications for data management, machine learning, natural language processing, and computer vision. Additional content includes ethics as relevant to the design and implementation of artificial intelligence.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting 18 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Explain the importance of managing the core phases of an Artificial Intelligence (AI) project lifecycle.
02.0 Describe ethical and socially responsible practices related to the development and deployment of intelligent systems.
03.0 Describe foundational machine learning concepts.
04.0 Describe data acquisition, preprocessing, and transformation for AI models.
05.0 Describe the use of artificial intelligence tools and how they may be applied to optimize an organization's capabilities.
06.0 Describe the application of basic techniques in computer vision for image classification and object detection.
07.0 Describe the application of basic techniques in natural language processing.

Florida Department of Education
Student Performance Standards

Program Title: **Artificial Intelligence Practitioner**
CIP Number: **0511010200**
Program Length: **18 credit hours**

This certificate program is part of the Applied Artificial Intelligence AS degree program (1511010200). At the completion of this program, the student will be able to:	
01.0	Explain the importance of managing the core phases of an Artificial Intelligence (AI) project lifecycle. The student will be able to:
01.01	Describe AI life cycle from concept to production.
01.02	Describe the importance of security technologies, processes and practices appropriate for each life cycle phase.
01.03	Describe the history, evolution and various applications of AI technology.
02.0	Describe ethical and socially responsible practices related to the development and deployment of intelligent systems. The student will be able to:
02.01	Recognize the value of developing equitable and fair AI solutions.
02.02	Describe the need for data transparency and responsibility in AI models.
02.03	Describe common major issues of ethical concern in the development and implementation of AI.
02.04	Explain the potential pitfalls in the absence of business policies that address ethics in the development, implementation, and administration of AI.
02.05	Define and compare ethical and legal implications of AI.
02.06	Identify, research, and analyze current events in the field of AI, considering new technology developments, social and ethical impacts, and future implications.
02.07	Identify and describe ethical and societal AI issues in a variety of settings such as public safety, finance, social media, marketing, government, and how these factors may impact different cultures and countries.
03.0	Describe foundational machine learning concepts. The student will be able to:
03.01	Describe the differences between supervised, unsupervised, and reinforcement learning.
03.02	Describe traditional machine learning algorithms and model development.
03.03	Describe methods of representation learning and model development.
03.04	Describe testing and validation of machine learning models.
03.05	Describe the various libraries available for implementation of machine learning models.
03.06	Explain the optimization of AI models in various contexts.

04.0	Describe data acquisition, preprocessing, and transformation for AI models. The student will be able to:
	04.01 Utilize various techniques for identifying data requirements.
	04.02 Identify and design a data collection plan.
	04.03 Identify attributes and benefits of data sources and associated collection strategies.
	04.04 Evaluate risks to data privacy, integrity, and availability.
	04.05 Apply methods to evaluate and interpret model outputs.
	04.06 Describe techniques to transform data from multiple sources and formats by utilizing visualization tools and fitting data to models.
	04.07 Identify and assess data readiness.
	04.08 Describe the benefits and disadvantages of data virtualization.
05.0	Describe the use of artificial intelligence tools and how they may be applied to optimize an organization's capabilities. The student will be able to:
	05.01 Utilize knowledge of available AI tools to accomplish specific objectives.
	05.02 Describe potential project pitfalls in tool selection.
	05.03 Identify alternative AI solutions.
	05.04 Explain various deployment strategies.
	05.05 Identify trends in emerging AI tools to address the evolving nature of AI systems.
06.0	Describe the application of basic techniques in computer vision for image classification and object detection. The student will be able to:
	06.01 Explore the application of computer vision to real world problems.
	06.02 Describe the data acquisition and exploration processes in computer vision.
	06.03 Outline the functions, applications, and usage of computer vision libraries.
	06.04 Describe the development and applications of Convolution Neural Networks (CNN).
	06.05 Describe an end-to-end Generative Adversarial Networks (GANs) model.
07.0	Describe the application of basic techniques in natural language processing. The student will be able to:
	07.01 Explore the application of natural language processing (NLP) to real world problems.
	07.02 Outline the various stages within the NLP pipeline.
	07.03 Describe algorithms and models used in NLP for speech recognition, language translation, and text analysis.
	07.04 Describe, compare, and apply text classifiers.
	07.05 Describe common platforms to deploy NLP models.

07.06 Evaluate ethical issues in language models.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Information Technology Administration**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511010307
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Internet Services Technology AS degree program (1511100400).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to Internet, Intranet, and Extranet environments; installing and configuring Intranet and web-based resources.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 18 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency with Internet structure, organization, and navigation.
02.0 Demonstrate understanding of networked environments, hardware and software.
03.0 Understand, install and configure computer hardware.
04.0 Understand, install and configure computer software.
05.0 Perform web design/development activities.
06.0 Perform website management activities.
07.0 Perform e-commerce-related tasks.

Florida Department of Education
Student Performance Standards

Program Title: **Information Technology Administration**
CIP Number: **0511010307**
Program Length: **18 credit hours**

This certificate program is part of the Internet Services Technology AS degree program (1511100400). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
01.01	Describe the origin of the Internet.
01.02	Outline the history of the Internet.
01.03	Describe Internet organization, such as the Internic, domains and requests for comments (RFCs).
01.04	Describe the structure of the Internet.
01.05	Differentiate between the Internet and the WWW.
01.06	Define Internet push technologies, such as e-mail marketing vs. webpage banner advertising.
01.07	Differentiate among an Intranet site, an extranet site, and an Internet site.
01.08	Describe and identify several major ethical and legal issues related to Internet use and how they affect intellectual property rights.
01.09	Describe the World Wide Web (WWW) and identify how it affects personal security and privacy and our society.
01.10	Describe and differentiate between file types and protocols.
01.11	Demonstrate the use of typical remote access mechanisms.
01.12	Describe various sections of a URL.
01.13	Discuss the use of Internet tools and utilities.
02.0	Demonstrate understanding of networked environments, hardware, and software. The student will be able to:
02.01	Give several advantages and disadvantages of networked and non-networked environments.
02.02	Describe current network environments and network topologies.
02.03	Identify and discuss issues such as security, privacy and redundancy related to networked environments.
02.04	Identify and discuss standardization issues related to naming conventions.
02.05	List and define layers in the OSI and TCP/IP network protocol models.
02.06	Identify and describe current relevant IEEE standards.

	02.07	Discuss the nature of IP and MAC addressing.
	02.08	Describe the major functions and requirements of web-based server and client hardware and software components.
	02.09	Identify a variety of specialized servers.
	02.10	Recognize and describe current cable technologies.
	02.11	Describe current wireless technologies.
	02.12	Describe the major functions of network connectivity hardware, such as hubs, repeaters, bridges, routers, switches, and gateways.
	02.13	Describe the hardware needed to connect a LAN to the Internet.
	02.14	Describe the function of network storage devices and other peripherals.
	02.15	Compare and contrast major functions and features of current network operating systems (including directory services).
	02.16	Differentiate between telecommunications and data communications.
	02.17	Compare and contrast digital communications lines and cable characteristics (e.g. ISDN, DSL, T-1, T-3).
03.0		Understand, install and configure computer hardware. The student will be able to:
	03.01	Explain the use of binary numbers to represent instructions and data.
	03.02	Describe the hardware implications of the use of binary representation of instructions and data.
	03.03	Convert numbers among decimal, binary, and hexadecimal representation.
	03.04	Perform binary arithmetic.
	03.05	Identify various data representation schemes (e.g., ASCII, Unicode).
	03.06	Discuss various data types such as signed and unsigned integers and floating point.
	03.07	Identify the major hardware platforms.
	03.08	Describe distinguishing features of the major hardware platforms.
	03.09	Describe the functions of major hardware components of a computer system.
	03.10	Recognize and correctly identify computing hardware components.
	03.11	Describe emerging hardware technologies and discuss their potential impact.
	03.12	Implement proper procedures for handling and safeguarding equipment.
	03.13	Perform preventive maintenance tasks on microcomputer systems.
	03.14	Describe procedures for proper disposal of computer components.
	03.15	Set up and configure systems and peripherals.

	03.16	Set up BIOS.
	03.17	Install and configure storage and I/O device interfaces.
	03.18	Install and configure multimedia devices and interfaces.
	03.19	Install and configure network interface cards.
04.0	Understand, install and configure computer software. The student will be able to:	
	04.01	Describe the functions and major components (e.g., BIOS and task management) of a computer operating system.
	04.02	Identify current operating systems and describe their important features.
	04.03	Use an operating system for activities such as data and file management.
	04.04	Identify current systems utilities and describe their functions.
	04.05	Use system software to perform routine maintenance tasks such as backup, and hard drive defragmentation.
	04.06	Use both stand-alone operating systems and network operating systems on different platforms.
	04.07	Create, use, and maintain system configuration files.
	04.08	Describe and use popular features and functions of the major categories of applications software (e.g., word processing, database, spreadsheet, presentation, email, browsers).
	04.09	Use software produced by multiple vendors.
	04.10	Transmit and exchange data in a multiple vendor software environment.
	04.11	Install and configure operating systems on multiple platforms.
	04.12	Describe procedures for uninstalling operating system software.
	04.13	Install and configure system software.
	04.14	Install, configure and upgrade applications software.
	04.15	Configure software for accessibility by disabled individuals.
	04.16	Describe conflict handling when installing, configuring and upgrading applications software.
	04.17	Install and configure client software for connecting to LANs, WANs, and the Internet.
	04.18	Install and configure client software for client/server and network-based applications (e.g., e-mail, videoconferencing, database).
	04.19	Install internetworking applications on a server and configure clients for network access.
	04.20	Describe the major functions of network client software components.
	04.21	Install and configure client software on multiple hardware platforms.
	04.22	Install and configure drivers for NICs and network peripherals (including printers).

	04.23	Configure the client to support multiple protocols.
	04.24	Install and configure network-based services such as videoconferencing, integrated voicemail/email/fax, large document storage and retrieval.
05.0	Perform web design/development activities. The student will be able to:	
	05.01	Describe and use the process of storyboarding a website.
	05.02	Describe format, structure and design principles for websites.
	05.03	Evaluate web graphic utilities and creation tools, including those for animated graphics.
	05.04	Identify existing resources and constraints.
	05.05	Evaluate design based on current industry and in-house standards.
	05.06	Create site navigation plan including directory structure.
	05.07	Procure/create and incorporate standard and animated graphics into a webpage.
	05.08	Obtain in-house content and determine needs for secondary content providers.
	05.09	Design page templates to implement on final site.
	05.10	Create a webpage using authoring tools.
	05.11	Code page(s) using current web programming languages.
	05.12	Check page for cross-browser capability and other access issues.
	05.13	Upload pages and run site analysis.
	05.14	Incorporate sound files onto a webpage.
	05.15	Incorporate a streaming video file onto a webpage.
	05.16	Incorporate a video file for download into a webpage.
	05.17	Create an animated graphic.
	05.18	Perform simple graphic modifications using a graphics utility.
	05.19	Incorporate an e-mail link on a webpage.
	05.20	Incorporate internal and external links on a webpage.
	05.21	Incorporate tables and file transfer capabilities on a webpage.
	05.22	Incorporate handicapped-accessibility options into the website.
	05.23	Configure a webpage for Search Engine Optimization.
	05.24	Create a web form and produce e-mail results.

	05.25 Create a web database interface.
	05.26 Discuss the issue of ODBC compliance.
06.0	Perform website management activities. The student will be able to:
	06.01 Describe the process of obtaining a domain address.
	06.02 Notify appropriate external search engines of the website.
	06.03 Compare features of currently available site management tools.
	06.04 Install and configure website management software.
	06.05 Create and maintain a website using a web management tool.
	06.06 Implement appropriate website security measures.
	06.07 Use and evaluate the results of a website visit-recording tool.
07.0	Perform e-commerce-related tasks. The student will be able to:
	07.01 Describe web e-commerce.
	07.02 Analyze e-commerce models.
	07.03 Develop e-commerce business and marketing plan.
	07.04 Identify components and procedures necessary to process credit card transactions including any security measures.
	07.05 Demonstrate an understanding of the credit card transaction process.
	07.06 Implement shopping cart software.
	07.07 Set up and configure online catalog to market products.
	07.08 Establish transaction storage and reporting system.
	07.09 Publish website.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Information Technology Support Specialist**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511010311
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Information Technology AS degree program (1511010307).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 18 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Install, configure, upgrade and troubleshoot computer hardware.
02.0 Install, configure, manage, and troubleshoot an operating system.
03.0 Demonstrate proficiency in supporting Windows-based client and network computer systems.
04.0 Demonstrate proficiency in installing, configuring, deploying, and supporting desktop applications.
05.0 Demonstrate proficiency in supporting Windows users.
06.0 Perform help desk support activities.

Florida Department of Education
Student Performance Standards

Program Title: **Information Technology Support Specialist**
CIP Number: **0511010311**
Program Length: **18 credit hours**

This certificate program is part of the Computer Information Technology AS degree program (0511010307). At the completion of this program, the student will be able to:	
01.0	Install, configure, upgrade and troubleshoot computer hardware. The student will be able to:
01.01	Describe the architecture and operation of a typical computer system.
01.02	Describe the use of binary numbers to represent instructions and data and the hardware implications.
01.03	Identify various hardware encoding schemes.
01.04	Describe and identify motherboards and their components.
01.05	Describe the features and types of computer form factors, chassis, power supplies and cooling devices.
01.06	Describe and identify mass storage devices.
01.07	Distinguish between the different display devices and their characteristics.
01.08	Summarize the function and types of adapter and interface cards.
01.09	Demonstrate the construction and configuration of a computer system from individual components.
01.10	Demonstrate the installation, configuration, optimization, and upgrading of components in portable devices.
01.11	Demonstrate the installation, configuration, optimization, maintenance, and upgrading of printers and other peripheral devices.
01.12	Troubleshoot new and existing computers and peripheral devices, and document the problems discovered and the solutions implemented.
01.13	Troubleshoot client-side network connectivity issues using appropriate tools.
01.14	Identify potential hazards and implement proper safety procedures, including electrostatic discharge (ESD) precautions and professional operational procedures, safe work environment and equipment handling.
02.0	Install, configure, manage, and troubleshoot an operating system. The student will be able to:
02.01	Identify the fundamental principles of operating systems.
02.02	Describe the general features and uses of current operating systems.
02.03	Compare and contrast features of popular operating systems.
02.04	Identify the names, locations, purposes, and contents of major operating system files.

02.05	Use command line functions and utilities to manage the operating system, including proper syntax and switches.
02.06	Create, view, and manage disks, directories and files, and change file attributes.
02.07	Identify the major operating system utilities, their purpose, location, and options.
02.08	Install major operating systems and bring the operating system to a basic operational level.
02.09	Perform operating system upgrades.
02.10	Create an emergency boot disk with utilities utilizing basic system boot sequences and boot methods.
02.11	Optimize the operating system and major operating system subsystems.
02.12	Distinguish and interpret the meaning of common error codes and startup messages from the boot sequence and identify steps to correct the problems.
02.13	Recognize when to use common diagnostic utilities and tools.
02.14	Select and use system utilities and tools to diagnose, troubleshoot and resolve operating system problems.
02.15	Detect and resolve common operational and usability problems.
02.16	Discuss the network protocols used by operating systems.
02.17	Explain how networking is supported by various operating systems.
02.18	Configure operating systems to connect to a local area network.
02.19	Configure operating systems to connect to and use Internet resources.
02.20	Troubleshoot client-side network connectivity issues using appropriate tools.
02.21	Perform file and system management tasks.
03.0	Demonstrate proficiency in supporting Windows-based client and network computer systems. The student will be able to:
03.01	Describe the features and characteristics of a well-deployed and operational client computer in a Windows networked environment.
03.02	Perform baseline measurements, perform security and performance audits on a client computer, and document findings.
03.03	Describe the methods of establishing, configuring and controlling group policies.
03.04	Configure and troubleshoot group policy settings for client computers in a Windows domain.
03.05	Configure, manage and troubleshoot task scheduler, event forwarding and monitoring tools on a Windows client computer.
03.06	Test, configure and schedule Windows updates, patches and service packs prior to and after network-wide deployment.
03.07	Troubleshoot Windows performance, reliability, and security issues.
03.08	Configure, manage, maintain and troubleshoot Windows security issues, including adding trusted sites, installing secure plug-ins, identifying group policy restrictions, obtaining certificates, analyzing services and programs.
03.09	Install, manage and maintain anti-malicious software, firewalls and access control.

	03.10 Configure, troubleshoot and secure network protocols and services for Windows client computers.
	03.11 Configure, enable, manage and troubleshoot VPN, mobile and remote access.
	03.12 Troubleshoot, resolve and document network issues, including wired and wireless connectivity, name resolution issues conflicts IP address, routing problems, security breaches, domain issues and group policy problems.
	03.13 Determine whether problems are a result of hardware issues, Windows issues, application failures, user errors or other reasons.
	03.14 Monitor events in an enterprise network and log incidents.
04.0	Demonstrate proficiency in installing, configuring, deploying, and supporting desktop applications. The student will be able to:
	04.01 Test functionality and compatibility of desktop applications and updates with operating system and the intended enterprise use.
	04.02 Demonstrate the common steps to install desktop applications.
	04.03 Configure and deploy desktop and enterprise applications in a networked environment.
	04.04 Manage software license policies.
	04.05 Perform support functions for deployed applications.
	04.06 Troubleshoot and resolve desktop application issues in a networked environment.
	04.07 Describe how product standards in the IT field emerged.
	04.08 Identify methods for evaluation and selection of products.
05.0	Demonstrate proficiency in supporting Windows users. The student will be able to:
	05.01 Configure the Windows interface and customize application features to meet user needs, including ADA accessibility.
	05.02 Configure and modify default user settings in Windows and applications to maximize user performance and to comply with business policies.
	05.03 Manage, maintain and backup Windows client computers according to business procedures and user needs without adversely affecting workplace activities.
	05.04 Migrate user data, settings and profile to a newly deployed and configured Windows computer.
	05.05 Configure, maintain and troubleshoot user account control and authentication issues.
	05.06 Determine whether a client is receiving regularly scheduled updates and resolve issues.
	05.07 Configure and troubleshoot user access to network resources.
	05.08 Perform a system recovery on a user computer and backup user data.
	05.09 Describe methods of understanding and managing user’s needs and expectations.
06.0	Perform help desk support activities. The student will be able to:
	06.01 Describe the role of the IT support function within the business organization.

06.02	Describe the incident management process and help desk service best practices when handling incidents.
06.03	Apply systematic problem-solving and troubleshooting processes to typical end-user issues.
06.04	Discuss the processes for resolving customer issues.
06.05	Describe strategies for handling difficult clients and incidents.
06.06	Identify and select a variety of tools and technologies that aid in the effective management of the help desk function.
06.07	Describe the process of identifying and resolving customer needs within the context of the business enterprise.
06.08	Describe the training process of end users and effective methods of delivering training materials.
06.09	Present and follow oral and written instructions.
06.10	Participate in group discussions as an IT support specialist and trainer.
06.11	Describe the types of end user documentation and the process of developing technical instructions for end users.
06.12	Prepare, outline, and deliver a short IT training presentation.
06.13	Use appropriate communication skills, courtesy, manners, and dress in the workplace.
06.14	Customize application features to meet user needs and to comply with ADA.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Information Technology Analysis**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511010312
Program Type	College Credit Certificate (CCC)
Program Length	27 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Information Technology AS degree program (1511010307).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to microcomputer oriented operating procedures, software applications packages, and hardware in order to select the appropriate information technology equipment for a particular microcomputer-based work environment; install information technology equipment, troubleshoot information technology equipment, support information technology users.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 27 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge of common Information Technology topics.
02.0 Install, configure, upgrade and troubleshoot computer hardware.
03.0 Install, configure and troubleshoot software system and device driver software and implement basic security measures.
04.0 Demonstrate an understanding of Internet structure, organization and navigation and how to support Internet access and applications.
05.0 Install, configure, manage, and troubleshoot an operating system.
06.0 Demonstrate knowledge of networking technologies.
07.0 Demonstrate foundational knowledge of project management.
08.0 Perform customer service skills.
09.0 Perform systems monitoring activities.
10.0 Perform computer information systems analysis activities.

Florida Department of Education
Student Performance Standards

Program Title: **Information Technology Analysis**
CIP Number: **0511010312**
Program Length: **27 credit hours**

This certificate program is part of the Computer Information Technology AS degree program (1511010307). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of common Information Technology topics. The student will be able to:
01.01	Distinguish between appropriate and inappropriate use of technology in a professional or academic setting.
02.0	Install, configure, upgrade and troubleshoot computer hardware. The student will be able to:
02.01	Describe the architecture and operation of a typical computer system.
02.02	Describe the use of binary numbers to represent instructions and data and the related hardware implications.
02.03	Identify various hardware encoding schemes.
02.04	Describe and identify motherboards and their components.
02.05	Describe the features and types of computer form factors, chassis, power supplies and cooling devices.
02.06	Describe and identify mass storage devices.
02.07	Distinguish between the different display devices and their characteristics.
02.08	Summarize the function and types of adapter and interface cards.
02.09	Demonstrate the construction and configuration of a computer system from individual components.
02.10	Demonstrate the installation, configuration, optimization, and upgrading of components in portable devices.
02.11	Demonstrate the installation, configuration, optimization, maintenance, and upgrading of printers and other peripheral devices.
02.12	Troubleshoot new and existing computers and peripheral devices, and document the problems discovered and the solutions implemented.
02.13	Troubleshoot client-side network connectivity issues using appropriate tools.
02.14	Identify potential hazards and implement proper safety procedures, including electrostatic discharge (ESD) precautions and professional operational procedures, safe work environment and equipment handling.
02.15	Install, configure and monitor updates, and perform system audits.
03.0	Install, configure and troubleshoot software system and device driver software and implement basic security measures. The student will be able to:
03.01	Describe the various types of device drivers used by operating systems and the utilities used to install, configure, manage, upgrade and troubleshoot system devices.

	03.02 Describe the device and driver installation process.
	03.03 Demonstrate the installation, configuration, and troubleshooting of device drivers.
	03.04 Verify digital signatures of device drivers.
	03.05 Demonstrate the configuration of driver policies.
	03.06 Describe the security tools and features in operating systems and how to access them to perform a security audit and update.
	03.07 Install, configure, and monitor firewalls and other security measures and policies to block dangerous or malicious incoming and outgoing network traffic.
	03.08 Install, configure and monitor anti-virus software.
	03.09 Perform anti-virus and other security scanning activities to prevent the infiltration of spyware and other malicious software.
	03.10 Perform preventive maintenance and activity monitoring for computer and network security.
	03.11 Identify the ways in which a virus can infect electronic devices.
	03.12 Describe common threats to the security of electronic devices.
04.0	Demonstrate an understanding of Internet structure, organization and navigation and how to support Internet access and applications. The student will be able to:
	04.01 Distinguish between legal and illegal file-sharing practices.
05.0	Install, configure, manage, and troubleshoot an operating system. The student will be able to:
	05.01 Perform file and system management tasks.
06.0	Demonstrate knowledge of networking technologies. The student will be able to:
	06.01 Identify the advantages and disadvantages of networked and non-network environments.
	06.02 Describe current networked environments, such as peer-to-peer and client/server.
	06.03 Identify and discuss issues such as security, privacy and redundancy related to networked environments.
	06.04 Identify and discuss issues related to naming conventions for domains, hosts, users, email, and network devices.
	06.05 Differentiate between telecommunications and data communications.
	06.06 List and define the layers in the OSI (Open Systems Interconnect) and TCP/IP (Transmission Control Protocol/Internet Protocol) network protocol models.
	06.07 Identify and describe current relevant IEEE (Institute of Electrical and Electronics Engineers) network standards.
	06.08 Describe and illustrate logical and physical network topologies, and explain the advantages and disadvantages of each topology.
	06.09 Describe the major functions and implementation of LAN (Local Area Network) hardware protocols and identify the physical components currently in use.
	06.10 Describe the LAN software protocols in current use.

	06.11	Discuss the characteristics of IP (Internet Protocol) addresses and MAC (Media Access Control) addresses, and mapping between protocol addressing schemes.
	06.12	Identify and differentiate cable technologies and their features.
	06.13	Identify and differentiate among wireless technologies.
	06.14	Describe the advantages and disadvantages of wireless and cable technologies, and identify the environments best suited for each technology.
	06.15	Describe the functions and characteristics of network hardware.
	06.16	Describe the hardware needed to connect a local area network to a wide area network and the Internet.
	06.17	Compare and contrast major functions and features of network operating systems.
	06.18	Describe the major functions of network server hardware and software components.
	06.19	Describe the major functions of network client hardware and software components.
	06.20	Install and configure network client software on multiple computer platforms with support for multiple network protocols.
	06.21	Describe the function of network storage devices and other peripherals.
	06.22	Describe installation and configuration of storage devices and other peripherals with network access.
	06.23	Describe the installation, configuration, updating, and troubleshooting of network drivers for network hosts and peripherals.
	06.24	Configure and troubleshoot network protocol stacks.
	06.25	Describe the characteristics of the current wide area network technologies and determine the most suitable WAN (Wide Area Network) technology for a given situation.
07.0	Demonstrate foundational knowledge of project management. The student will be able to:	
	07.01	Describe the steps in planning and managing a project.
	07.02	Define an implementation schedule for a project.
	07.03	Collaborate on group projects.
	07.04	Choose appropriate actions in situations that require effective time management.
	07.05	Describe the five process groups of the project life cycle.
	07.06	Describe the factors that contribute to risk management planning.
	07.07	Explain the cultural, social, international, political and physical aspects of the project environment.
08.0	Perform customer service skills. The student will be able to:	
	08.01	Identify and recognize user’s state of mind and attitude.
	08.02	Determine the customer needs using system analysis strategies.

	08.03	Listen to the customer and ask appropriate questions.
	08.04	Maintain professionalism when working with customers and competitors.
	08.05	Provide suggested solutions using knowledge base.
	08.06	Promote company services, products, and policies when appropriate.
	08.07	Maintain professional work ethics and follow policies and procedures.
	08.08	Demonstrate respect for the customer workspace/environment.
	08.09	Relate all information to customer in a manner that the customer can understand.
	08.10	Set realistic expectations when establishing deadlines for customer solutions.
	08.11	Communicate action plan including timelines.
	08.12	Recognize the existence of internal/external customers and follow appropriate guidelines for each.
09.0	Perform systems monitoring activities. The student will be able to:	
	09.01	Create and review back up, server, application, resolution, and security logs.
	09.02	Track network performance.
	09.03	Identify problem trends and create resolution plans.
	09.04	Document statistical analysis and monitoring activities.
10.0	Perform computer information systems analysis activities. The student will be able to:	
	10.01	Prepare appropriate systems and analysis charts and other visual aids.
	10.02	Describe the major steps in the systems development cycle.
	10.03	Perform basic business related tasks using the most appropriate software applications.
	10.04	Identify situations where software packages and/or custom developed packages need to be integrated with each other.
	10.05	Identify situations where software packages and/or hardware need to be integrated with software/hardware available on other types of computers.
	10.06	Select appropriate hardware devices to accomplish assigned tasks.
	10.07	Identify appropriate vendor sources for software, hardware and auxiliary supplies.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Help Desk Support Technician**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511010313
Program Type	College Credit Certificate (CCC)
Program Length	16 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Information Technology AS degree program (1511010307).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 16 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Install, configure, manage, deploy, monitor and troubleshoot a networked server environment.
02.0 Install, configure, manage, and troubleshoot an operating system.
03.0 Install, configure, upgrade and troubleshoot computer hardware.
04.0 Install, configure and troubleshoot system and device driver software and implement basic security measures.
05.0 Perform customer service skills.
06.0 Perform help desk support activities.

Florida Department of Education
Student Performance Standards

Program Title: **Help Desk Support Technician**
CIP Number: **0511010313**
Program Length: **16 credit hours**

This certificate program is part of the Computer Information Technology AS degree program (1511010307). At the completion of this program, the student will be able to:	
01.0	Install, configure, manage, deploy, monitor and troubleshoot a networked server environment. The student will be able to:
01.01	Analyze the business environment and select a server deployment and licensing method.
01.02	Describe the major steps and issues associated with server deployment and draft a server migration strategy.
01.03	Describe, install and configure the server deployment tools.
01.04	Perform data and user backup for migration to a new server environment.
01.05	Prepare, install and test a reference system including updates, device drivers, and base utilities and applications for the creation of a client image.
01.06	Configure the reference system's settings to optimize performance, security, and updates, provide network access and administrative controls, and standardize features to comply with business needs.
01.07	Create, capture, test and manage the custom image of the reference system.
01.08	Deploy the reference system to client computers in a networked environment.
01.09	Migrate current applications and user data after deployment, and verify and troubleshoot deployment issues.
01.10	Configure, manage and troubleshoot device drivers, network settings, peripheral devices and printers.
01.11	Join the client to a domain and configure network policies.
01.12	Describe methods of creating and maintaining network policies.
01.13	Create, modify, and administer users and groups for clients.
01.14	Configure, manage and troubleshoot client mobile features including configuring mobile devices, power management, disk encryption, wireless networking, VPN and remote access.
01.15	Configure, manage and troubleshoot client access to the network, network resources, and the Internet.
01.16	Configure, manage and troubleshoot administrative settings including: group policies, user profiles, permissions, user account control, event viewing, forwarding and logging, task scheduler, performance monitoring, Windows updates, security settings, firewall features, and authentication.
01.17	Analyze business needs and licensing requirements in the selection of enterprise applications for deployment in networked environment.

	01.18	Assess hardware requirements and compatibility with existing applications and devices.
	01.19	Perform application performance and compatibility testing and troubleshooting prior to application software installation.
	01.20	Install and configure business application.
	01.21	Deploy single license applications on a client computer.
	01.22	Troubleshoot application software installation and compatibility issues.
	01.23	Describe the role of desktop support in a network environment.
	01.24	Perform management, testing, and troubleshoot activities.
	01.25	Document incidents and support activities.
	01.26	Perform post-installation tasks, compatibility and reliability testing, resolve performance issues, and perform a security audit.
	01.27	Utilize hardware and software installation tools to perform testing, maintenance and updates.
	01.28	Perform support functions for clients, users and deployed applications, including end user support and training.
	01.29	Configure, manage and monitor administrative features and security settings.
	01.30	Document installed software, conduct license auditing, create a performance baseline, and draft a troubleshooting checklist.
02.0	Install, configure, manage, and troubleshoot an operating system. The student will be able to:	
	02.01	Identify the fundamental principles of operating systems.
	02.02	Describe the general features and uses of current operating systems.
	02.03	Compare and contrast features of popular operating systems.
	02.04	Identify the names, locations, purposes, and contents of major operating system files.
	02.05	Use command line functions and utilities to manage the operating system, including proper syntax and switches.
	02.06	Create, view, and manage disks, directories and files, and change file attributes.
	02.07	Identify the major operating system utilities, their purpose, location, and options.
	02.08	Install major operating systems and bring the operating system to a basic operational level.
	02.09	Perform operating system upgrades.
	02.10	Create an emergency boot disk with utilities utilizing basic system boot sequences and boot methods.
	02.11	Optimize the operating system and major operating system subsystems.
	02.12	Distinguish and interpret the meaning of common error codes and startup messages from the boot sequence and identify steps to correct the problems.
	02.13	Recognize when to use common diagnostic utilities and tools.

	02.14 Select and use system utilities and tools to diagnose, troubleshoot and resolve operating system problems.
	02.15 Detect and resolve common operational and usability problems.
	02.16 Discuss the network protocols used by operating systems.
	02.17 Explain how networking is supported by various operating systems.
	02.18 Configure operating systems to connect to a local area network.
	02.19 Configure operating systems to connect to and use Internet resources.
	02.20 Troubleshoot and diagnose basic network and Internet connectivity problems.
	02.21 Perform file and system management tasks.
03.0	Install, configure, upgrade and troubleshoot computer hardware. The student will be able to:
	03.01 Describe the architecture and operation of a typical computer system.
	03.02 Describe the use of binary numbers to represent instructions and data and the hardware implications.
	03.03 Identify various hardware encoding schemes.
	03.04 Describe and identify motherboards and their components.
	03.05 Describe the features and types of computer form factors, chassis, power supplies and cooling devices.
	03.06 Describe and identify mass storage devices.
	03.07 Distinguish between the different display devices and their characteristics.
	03.08 Summarize the function and types of adapter and interface cards.
	03.09 Demonstrate the construction and configuration of a computer system from individual components.
	03.10 Demonstrate the installation, configuration, optimization, and upgrading of components in portable devices.
	03.11 Demonstrate the installation, configuration, optimization, maintenance, and upgrading of printers and other peripheral devices.
	03.12 Troubleshoot new and existing computers and peripheral devices, and document the problems discovered and the solutions implemented.
	03.13 Troubleshoot client-side network connectivity issues using appropriate tools.
	03.14 Identify potential hazards and implement proper safety procedures, including electrostatic discharge (ESD) precautions and professional operational procedures, safe work environment and equipment handling.
	03.15 Install, configure and monitor updates and perform system audits.
04.0	Install, configure and troubleshoot software system and device driver software and implement basic security measures. The student will be able to:
	04.01 Describe the various types of device drivers used by operating systems and the utilities used to install, configure, manage, upgrade and troubleshoot system devices.

	04.02	Describe the device and driver installation process.
	04.03	Demonstrate the installation, configuration, and troubleshooting of device drivers.
	04.04	Verify digital signatures of device drivers.
	04.05	Demonstrate the configuration of driver policies.
	04.06	Describe the security tools and features in operating systems and how to access them to perform a security audit and update.
	04.07	Install, configure and monitor firewalls to block dangerous incoming and outgoing network traffic.
	04.08	Install, configure and monitor anti-virus software.
	04.09	Perform anti-virus and other security scanning activities to prevent the infiltration of spyware and other malicious software.
	04.10	Install, configure, and monitor firewalls and other security measures and policies to block dangerous or malicious incoming and outgoing network traffic.
	04.11	Perform preventative maintenance and activity monitoring for computer and network security.
05.0	Perform customer service skills. The student will be able to:	
	05.01	Identify and recognize user's state of mind and attitude.
	05.02	Determine the customer needs using system analysis strategies.
	05.03	Listen to the customer and ask appropriate questions.
	05.04	Provide suggested solutions using knowledge base.
	05.05	Promote company services, products, and policies when appropriate.
	05.06	Maintain professional work ethics and follow policies and procedures.
	05.07	Demonstrate respect for the customer workspace/environment.
	05.08	Relate all information to customer in a manner that the customer can understand.
	05.09	Set realistic expectations when establishing deadlines for customer solutions.
	05.10	Communicate action plan including timelines.
	05.11	Recognize the existence of internal/external customers and follow appropriate guidelines for each.
06.0	Perform help desk support activities. The student will be able to:	
	06.01	Describe the role of the IT support function within the business organization.
	06.02	Describe the incident management process and help desk service best practices when handling incidents.
	06.03	Apply systematic problem-solving and troubleshooting processes to typical end-user issues.
	06.04	Discuss the processes for resolving customer issues.

06.05	Describe strategies for handling difficult clients and incidents.
06.06	Identify and select a variety of tools and technologies that aid in the effective management of the help desk function.
06.07	Describe the process of identifying and resolving customer needs within the context of the business enterprise.
06.08	Describe the training process of end users and effective methods of delivering training materials.
06.09	Present and follow oral and written instructions.
06.10	Participate in group discussions as an IT support specialist and trainer.
06.11	Describe the types of end user documentation and the process of developing technical instructions for end users.
06.12	Prepare, outline, and deliver a short IT training presentation.
06.13	Use appropriate communication skills, courtesy, manners, and dress in the workplace.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.
This program title has changed, formerly Computer Programming Specialist.

Program Title: **Software Development Specialist**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511020103
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Software Development degree program (1511020101).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as software developers, entry level software developers, software developer specialists, entry level programmers, programmer specialists, computer programmers, senior programmers, chief business programmers, programmer analysts, and information systems programmers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content prepares individuals to analyze business situations and to design, develop and write computer programs; to store, locate, and retrieve specific documents, data, and information; analyze problems using logic/analysis tools, code into computer language; test, monitor, debug, document and maintain computer programs.

More than one programming language should be addressed in this certificate program.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 18 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
	01.01 Use reading skills.
	01.02 Use writing skills.
	01.03 Use mathematical strategies and procedures.
	01.04 Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
	02.01 Use critical thinking.
	02.02 Use creativity.
	02.03 Make sound decisions.
	02.04 Solve problems.
	02.05 Reason.
	02.06 Plan and organize.
03.0	Manage resources within an industry project
	03.01 Manage time.
	03.02 Manage money or resources.
	03.03 Manage materials.
	03.04 Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
	04.01 Manage systems.
	04.02 Monitor systems.
	04.03 Improve systems.
05.0	Use information for decision making.
	05.01 Locate information.
	05.02 Organize information.
	05.03 Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform data file activities.
02.0 Perform program design activities.
03.0 Perform coding activities.
04.0 Perform testing activities.
05.0 Perform implementation activities.
06.0 Develop an algorithm that solves a problem.
07.0 Demonstrate proficiency in the use of AI tools in software development.

Florida Department of Education
Student Performance Standards

Program Title: **Software Development Specialist**
CIP Number: **0511020103**
Program Length: **18 credit hours**

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101). At the completion of this program, the student will be able to:	
01.0	Perform data file activities. The student will be able to:
01.01	Identify methods of file organization.
01.02	Select an efficient method of file organization for a given situation.
01.03	Identify security procedures to maintain integrity of files.
01.04	Identify and modify file access/privilege levels (read, write, modify, delete).
02.0	Perform program design activities. The student will be able to:
02.01	Demonstrate proficiency in design of information technology systems.
02.02	Describe various components of computer systems.
02.03	Develop design specifications.
02.04	Select a feasible development environment.
02.05	Validate design specifications.
02.06	Document design.
02.07	Communicate design specifications.
02.08	Develop prototype.
02.09	Assist in revisions and enhancements of software systems.
03.0	Perform coding activities. The student will be able to:
03.01	Identify modules.
03.02	Design modules.
03.03	Code modules.
03.04	Document modules.
03.05	Test modules.

	03.06 Debug code.
	03.07 Revise code.
	03.08 Assemble modules.
	03.09 Demonstrate proficient use of programming development tools.
04.0	Perform testing activities. The student will be able to:
	04.01 Develop test plan.
	04.02 Develop test data.
	04.03 Validate input(s).
	04.04 Perform test(s).
	04.05 Validate expected outcomes.
	04.06 Determine boundary test cases.
	04.07 Load-test the system.
	04.08 Revise program code as necessary.
	04.09 Document test results.
05.0	Perform implementation activities. The student will be able to:
	05.01 Develop an implementation plan.
	05.02 Install system.
	05.03 Validate system.
	05.04 Troubleshoot methodologies.
	05.05 Document implementation.
06.0	Develop an algorithm that solves a problem. The student will be able to:
	06.01 List the steps in problem solving.
	06.02 Write pseudocode for sequential control structures.
	06.03 Write pseudocode for selection control structures.
	06.04 Write pseudocode for repetition control structures.
	06.05 Discuss the efficiency of an algorithm.
	06.06 Implement the algorithm.

07.0	Demonstrate proficiency in the use of AI tools in software development.
07.01	List AI tools commonly used in the software development process.
07.02	Explain the pros and cons of using AI tools for software development.
07.03	Describe how AI tools can be used in each stage of the software development process.
07.04	Explain how AI tools can enhance a software developer's creativity and problem-solving efficiency.
07.05	Explain how AI tools can enhance the functionality of a finished program.
07.06	Describe the ethical considerations of using AI tools for software development.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Internet of Things Applications**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511020110
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as software developers, entry level software developers, software developer specialists, entry level programmers, programmer specialists, computer programmers, senior programmers, chief business programmers, programmer analysts, and information systems programmers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

More than one programming language should be addressed in this certificate program.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform data file activities.
02.0 Perform analysis activities.
03.0 Perform program design activities.
04.0 Perform coding activities.
05.0 Demonstrate fundamental proficiency in network security essentials.
06.0 Perform testing activities.
07.0 Perform implementation activities.
08.0 Perform evaluation activities.
09.0 Develop an algorithm that solves a problem.
10.0 Demonstrate proficiency in the use of AI tools in software development.
11.0 Demonstrate professionalism, employability, and workplace skills.

Florida Department of Education
Student Performance Standards

Program Title: **Internet of Things Applications**
CIP Number: **0511020110**
Program Length: **24 credit hours**

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101). At the completion of this program, the student will be able to:	
01.0	Perform data file activities. The student will be able to:
01.01	Select an efficient method of file organization for a given situation.
01.02	Identify security procedures to maintain integrity of files.
02.0	Perform analysis activities. The student will be able to:
02.01	Communicate with users to ascertain system requirements.
02.02	Develop information system requirements to accomplish specific task.
02.03	Analyze and document user requirements.
02.04	Evaluate alternative solutions.
02.05	Analyze and document system requirements.
02.06	Create a plan for the design phase of an information technology system.
02.07	Develop a timeline for system development.
02.08	Communicate the plan.
02.09	Develop systems specifications.
02.10	Develop systems documentation.
02.11	Identify technical and operational feasibility issues in determining a system solution.
03.0	Perform program design activities. The student will be able to:
03.01	Describe various components of computer systems.
03.02	Develop design specifications.
03.03	Select a feasible development environment.
03.04	Validate design specifications.
03.05	Document a design.

	03.06 Communicate design specifications.
	03.07 Develop a prototype.
	03.08 Assist in revisions and enhancements of software systems.
04.0	Perform coding activities. The student will be able to:
	04.01 Identify modules.
	04.02 Design modules.
	04.03 Code modules.
	04.04 Document modules.
	04.05 Test modules.
	04.06 Debug code.
	04.07 Revise code.
	04.08 Assemble modules.
	04.09 Demonstrate proficient use of programming development tools.
05.0	Demonstrate fundamental proficiency in network security essentials. The student will be able to:
	05.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	05.02 Define and describe malicious software and techniques to protect systems from its effects.
	05.03 Describe Denial of Service attacks and means to defend against them.
	05.04 Identify the risks and techniques of data loss and its prevention.
	05.05 Describe the principles and techniques of securing data storage and transmission.
	05.06 Identify current encryption and authentication standards.
	05.07 Implement security policies, including compliance and operational security.
	05.08 Enable access control, identity management and security logging.
	05.09 Manage client and network system security software and related updates.
	05.10 Describe the functions and characteristics of firewalls.
	05.11 Perform a ping sweep to identify network hosts.
	05.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	05.13 Describe the purpose and operation of network protocol analyzers.

	05.14 Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
06.0	Perform testing activities. The student will be able to:
	06.01 Develop test plan.
	06.02 Develop test data.
	06.03 Validate input(s).
	06.04 Perform test(s).
	06.05 Validate expected outcomes.
	06.06 Determine boundary test cases.
	06.07 Load-test the system.
	06.08 Revise program code as necessary.
	06.09 Document test results.
	06.10 Evaluate system performance.
07.0	Perform implementation activities. The student will be able to:
	07.01 Develop an implementation plan.
	07.02 Install system.
	07.03 Validate system.
	07.04 Troubleshoot methodologies.
	07.05 Document implementation.
08.0	Perform evaluation activities. The student will be able to:
	08.01 Review software development plans.
	08.02 Assess validity and performance of software systems.
	08.03 Identify improvements to software systems.
	08.04 Assist in revisions and enhancements of software systems.
	08.05 Assist in project evaluation.
	08.06 Recommend improvements.
	08.07 Provide feedback to management, users and peer groups.
09.0	Develop an algorithm that solves a problem. The student will be able to:

	09.01 List the steps in problem solving.
	09.02 Write pseudocode using sequential control structures.
	09.03 Write pseudocode using selection control structures.
	09.04 Write pseudocode using repetition control structures.
	09.05 Discuss the efficiency of an algorithm.
	09.06 Implement the algorithm.
10.0	Demonstrate proficiency in the use of AI tools in software development. The student will be able to:
	10.01 List AI tools commonly used in the software development process.
	10.02 Explain the pros and cons of using AI tools for software development.
	10.03 Describe how AI tools can be used in each stage of the software development process.
	10.04 Explain how AI tools can enhance a software developer's creativity and problem-solving efficiency.
	10.05 Explain how AI tools can enhance the functionality of a finished program.
	10.06 Describe the ethical considerations of using AI tools for software development.
11.0	Demonstrate professionalism, employability, and workplace skills. The student will be able to:
	11.01 Produce professional business documents, including resumes, business letters, and memos.
	11.02 Prepare, outline, and deliver short oral presentations in professional settings.
	11.03 Utilize research skills to gather relevant information, data, and graphics for work-related tasks.
	11.04 Demonstrate appropriate communication and interpersonal skills when interacting with coworkers, customers, and supervisors.
	11.05 Understand and apply professional dress, demeanor, and behavior appropriate for specific corporate cultures.
	11.06 Maintain professional work ethics by following company policies, procedures, and legal regulations.
	11.07 Demonstrate accountability, responsibility, and self-motivation to complete work assignments.
	11.08 Manage conflict and interact with customers or colleagues in a professional manner, even in difficult situations.
	11.09 Demonstrate reliability by consistently meeting deadlines and maintaining a strong work ethic.
	11.10 Identify career opportunities and set realistic, achievable professional goals.
	11.11 Research emerging technologies and industry trends to stay informed about the job market.
	11.12 Build and maintain a professional network, including seeking mentorship and advice from industry experts.
	11.13 Utilize job search strategies, including resume writing, interview preparation, and personal branding.

11.14	Follow both oral and written instructions to successfully complete tasks and assignments.
11.15	Prioritize tasks, manage time effectively, and meet deadlines consistently.
11.16	Understand and apply workplace health, safety, and security protocols.
11.17	Adapt communication style and behavior to fit various organizational cultures and workplace environments.
11.18	Collaborate with others in a team-oriented environment, contributing positively to group work.
11.19	Research and identify job roles and career paths in the computer programming and software development fields.
11.20	Understand the skills and qualifications required for various positions in technology and prepare accordingly.
11.21	Set expectations for job search processes, including interviewing, salary negotiation, and understanding career growth opportunities.
11.22	Exhibit effective problem-solving skills and decision-making abilities in the workplace.
11.23	Show self-motivation, adaptability, and initiative when tackling work-related challenges.
11.24	Follow guidelines for effective time management and organizational strategies.
11.25	Take responsibility for one’s own professional development and seek opportunities for growth and learning.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Artificial Intelligence Awareness**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511020113
Program Type	College Credit Certificate (CCC)
Program Length	9 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to understanding the impact of artificial intelligence (AI) in solving real world problems, AI tools and applications used across various industries, the functions of AI chatbots, the AI project cycle, and the manipulation of data using programming functions and packages. Additional content includes ethics as relevant to the design, implementation, and administration of artificial intelligence and emerging technologies.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 9 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform analysis activities.
02.0 Perform user-support activities.
03.0 Demonstrate proficiency in the use of AI tools in software development.
04.0 Demonstrate professionalism, employability, and workplace skills.

Florida Department of Education
Student Performance Standards

Program Title: **Artificial Intelligence Awareness**
CIP Number: **0511020113**

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101). At the completion of this program, the student will be able to:	
01.0	Perform analysis activities. The student will be able to:
01.01	Communicate with users to ascertain system requirements.
01.02	Develop information system requirements to accomplish specific task.
01.03	Analyze and document user requirements.
01.04	Evaluate alternative solutions.
01.05	Analyze and document system requirements.
01.06	Create a plan for the design phase of an information technology system.
01.07	Develop systems specifications.
01.08	Develop systems documentation.
01.09	Identify technical and operational feasibility issues in determining a system solution.
02.0	Perform user-support activities. The student will be able to:
02.01	Demonstrate appropriate communication and interpersonal skills.
02.02	Determine the customer needs using system analysis strategies.
02.03	Provide suggested information technology solutions.
02.04	Research and understand specific corporate culture.
02.05	Maintain professional work ethics and follow policies and procedures.
02.06	Set realistic expectations when establishing deadlines for customer solutions.
02.07	Communicate action plan including timelines.
02.08	Recognize the existence of internal/external customers and follow appropriate guidelines for each.
03.0	Demonstrate proficiency in the use of AI tools in software development. The student will be able to:
03.01	List AI tools commonly used in the software development process.
03.02	Explain the pros and cons of using AI tools for software development.

	03.03	Describe how AI tools can be used in each stage of the software development process.
	03.04	Explain how AI tools can enhance a software developer's creativity and problem-solving efficiency.
	03.05	Explain how AI tools can enhance the functionality of a finished program.
	03.06	Describe the ethical considerations of using AI tools for software development.
04.0	Demonstrate professionalism, employability, and workplace skills. The student will be able to:	
	04.01	Produce professional business documents, including resumes, business letters, and memos.
	04.02	Prepare, outline, and deliver short oral presentations in professional settings.
	04.03	Utilize research skills to gather relevant information, data, and graphics for work-related tasks.
	04.04	Demonstrate appropriate communication and interpersonal skills when interacting with coworkers, customers, and supervisors.
	04.05	Understand and apply professional dress, demeanor, and behavior appropriate for specific corporate cultures.
	04.06	Maintain professional work ethics by following company policies, procedures, and legal regulations.
	04.07	Demonstrate accountability, responsibility, and self-motivation to complete work assignments.
	04.08	Manage conflict and interact with customers or colleagues in a professional manner, even in difficult situations.
	04.09	Demonstrate reliability by consistently meeting deadlines and maintaining a strong work ethic.
	04.10	Identify career opportunities and set realistic, achievable professional goals.
	04.11	Research emerging technologies and industry trends to stay informed about the job market.
	04.12	Build and maintain a professional network, including seeking mentorship and advice from industry experts.
	04.13	Utilize job search strategies, including resume writing, interview preparation, and personal branding.
	04.14	Follow both oral and written instructions to successfully complete tasks and assignments.
	04.15	Prioritize tasks, manage time effectively, and meet deadlines consistently.
	04.16	Understand and apply workplace health, safety, and security protocols.
	04.17	Adapt communication style and behavior to fit various organizational cultures and workplace environments.
	04.18	Collaborate with others in a team-oriented environment, contributing positively to group work.
	04.19	Research and identify job roles and career paths in the computer programming and software development fields.
	04.20	Understand the skills and qualifications required for various positions in technology and prepare accordingly.
	04.21	Set expectations for job search processes, including interviewing, salary negotiation, and understanding career growth opportunities.
	04.22	Exhibit effective problem-solving skills and decision-making abilities in the workplace.

04.23	Show self-motivation, adaptability, and initiative when tackling work-related challenges.
04.24	Follow guidelines for effective time management and organizational strategies.
04.25	Take responsibility for one's own professional development and seek opportunities for growth and learning.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.
This program title has changed, formerly Computer Programmer.

Program Title: **Software Developer**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511020200
Program Type	College Credit Certificate (CCC)
Program Length	33 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as software developers, entry level software developers, software developer specialists, entry level programmers, programmer specialists, computer programmers, senior programmers, chief business programmers, programmer analysts, and information systems programmers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content prepares individuals to analyze business situations and to design, develop and write computer programs; to store, locate, and retrieve specific documents, data, and information; analyze problems using logic/analysis tools, code into computer language; test, monitor, debug, document and maintain computer programs.

More than one programming language should be addressed in this certificate program.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 33 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
  - Related AS and AAS degrees.
  - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform data file activities.
02.0 Perform analysis activities.
03.0 Perform program design activities.
04.0 Perform coding activities.
05.0 Perform testing activities.
06.0 Perform user-training activities.
07.0 Perform implementation activities.
08.0 Perform user-support activities.
09.0 Perform evaluation activities.
10.0 Develop an algorithm that solves a problem.
11.0 Demonstrate proficiency in the use of AI tools in software development.
12.0 Demonstrate professionalism, employability, and workplace skills.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Programmer**
CIP Number: **0511020200**
Program Length: **33 credit hours**

This certificate program is part of the Computer Programming and Analysis AS degree program (1511020101). At the completion of this program, the student will be able to:	
01.0	Perform data file activities. The student will be able to:
01.01	Identify methods of file organization.
01.02	Select an efficient method of file organization for a given situation.
01.03	Identify security procedures to maintain integrity of files.
01.04	Identify and modify file access/privilege levels (read, write, modify, delete).
02.0	Perform analysis activities. The student will be able to:
02.01	Communicate with users to ascertain system requirements.
02.02	Develop information system requirements to accomplish specific task.
02.03	Analyze and document user requirements.
02.04	Evaluate alternative solutions.
02.05	Analyze and document system requirements.
02.06	Create a plan for the design phase of an information technology system.
02.07	Develop a timeline for system development.
02.08	Communicate the plan.
02.09	Develop systems specifications.
02.10	Develop systems documentation.
02.11	Identify technical and operational feasibility issues in determining a system solution.
03.0	Perform program design activities. The student will be able to:
03.01	Demonstrate proficiency in design of information technology systems.
03.02	Describe various components of computer systems.
03.03	Develop design specifications.

	03.04 Select a feasible development environment.
	03.05 Validate design specifications.
	03.06 Document design.
	03.07 Communicate design specifications.
	03.08 Develop prototype.
	03.09 Assist in revisions and enhancements of software systems.
04.0	Perform coding activities. The student will be able to:
	04.01 Identify modules.
	04.02 Design modules.
	04.03 Code modules.
	04.04 Document modules.
	04.05 Test modules.
	04.06 Debug code.
	04.07 Revise code.
	04.08 Assemble modules.
	04.09 Demonstrate proficient use of programming development tools.
05.0	Perform testing activities. The student will be able to:
	05.01 Develop test plan.
	05.02 Develop test data.
	05.03 Validate input(s).
	05.04 Perform test(s).
	05.05 Validate expected outcomes.
	05.06 Determine boundary test cases.
	05.07 Load-test the system.
	05.08 Revise program code as necessary.
	05.09 Document test results.
06.0	Perform user-training activities. The student will be able to:

	06.01 Assist in development of user documentation.
	06.02 Assist in development of training plan.
	06.03 Demonstrate appropriate user training techniques.
07.0	Perform implementation activities. The student will be able to:
	07.01 Develop an implementation plan.
	07.02 Install system.
	07.03 Validate system.
	07.04 Troubleshoot methodologies.
	07.05 Document implementation.
08.0	Perform user-support activities. The student will be able to:
	08.01 Demonstrate proficient use of productivity software (word processing, spreadsheets, databases, presentation) skills.
	08.02 Demonstrate appropriate communication and interpersonal skills.
	08.03 Determine the customer needs using system analysis strategies.
	08.04 Listen to the customer and ask appropriate questions.
	08.05 Persist when dealing with difficult customers maintaining a professional demeanor.
	08.06 Provide suggested information technology solutions.
	08.07 Research and understand specific corporate culture.
	08.08 Use tact when dealing with customer and competitors.
	08.09 Maintain professional work ethics and follow policies and procedures.
	08.10 Respect customer work space/environment.
	08.11 Set realistic expectations when establishing deadlines for customer solutions.
	08.12 Communicate action plan including timelines.
	08.13 Recognize the existence of internal/external customers and follow appropriate guidelines for each.
09.0	Perform evaluation activities. The student will be able to:
	09.01 Review software development plans.
	09.02 Assess validity and performance of software systems.
	09.03 Identify improvements to software systems.

	09.04 Assist in revisions and enhancements of software systems.
	09.05 Assist in project evaluation.
	09.06 Recommend improvements.
	09.07 Provide feedback to management, users and peer groups.
10.0	Develop an algorithm that solves a problem. The student will be able to:
	10.01 List the steps in problem solving.
	10.02 Write pseudocode for sequential control structures.
	10.03 Write pseudocode for selection control structures.
	10.04 Write pseudocode for repetition control structures.
	10.05 Discuss the efficiency of an algorithm.
	10.06 Implement the algorithm.
11.0	Demonstrate proficiency in the use of AI tools in software development. The student will be able to:
	11.01 List AI tools commonly used in the software development process.
	11.02 Explain the pros and cons of using AI tools for software development.
	11.03 Describe how AI tools can be used in each stage of the software development process.
	11.04 Explain how AI tools can enhance a software developer's creativity and problem-solving efficiency.
	11.05 Explain how AI tools can enhance the functionality of a finished program.
	11.06 Describe the ethical considerations of using AI tools for software development.
12.0	Demonstrate professionalism, employability, and workplace skills. The student will be able to:
	12.01 Produce professional business documents, including resumes, business letters, and memos.
	12.02 Prepare, outline, and deliver short oral presentations in professional settings.
	12.03 Utilize research skills to gather relevant information, data, and graphics for work-related tasks.
	12.04 Demonstrate appropriate communication and interpersonal skills when interacting with coworkers, customers, and supervisors.
	12.05 Understand and apply professional dress, demeanor, and behavior appropriate for specific corporate cultures.
	12.06 Maintain professional work ethics by following company policies, procedures, and legal regulations.
	12.07 Demonstrate accountability, responsibility, and self-motivation to complete work assignments.
	12.08 Manage conflict and interact with customers or colleagues in a professional manner, even in difficult situations.

12.09	Demonstrate reliability by consistently meeting deadlines and maintaining a strong work ethic.
12.10	Identify career opportunities and set realistic, achievable professional goals.
12.11	Research emerging technologies and industry trends to stay informed about the job market.
12.12	Build and maintain a professional network, including seeking mentorship and advice from industry experts.
12.13	Utilize job search strategies, including resume writing, interview preparation, and personal branding.
12.14	Follow both oral and written instructions to successfully complete tasks and assignments.
12.15	Prioritize tasks, manage time effectively, and meet deadlines consistently.
12.16	Understand and apply workplace health, safety, and security protocols.
12.17	Adapt communication style and behavior to fit various organizational cultures and workplace environments.
12.18	Collaborate with others in a team-oriented environment, contributing positively to group work.
12.19	Research and identify job roles and career paths in the computer programming and software development fields.
12.20	Understand the skills and qualifications required for various positions in technology and prepare accordingly.
12.21	Set expectations for job search processes, including interviewing, salary negotiation, and understanding career growth opportunities.
12.22	Exhibit effective problem-solving skills and decision-making abilities in the workplace.
12.23	Show self-motivation, adaptability, and initiative when tackling work-related challenges.
12.24	Follow guidelines for effective time management and organizational strategies.
12.25	Take responsibility for one’s own professional development and seek opportunities for growth and learning.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Oracle Certified Database Administrator**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511020307
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Database Technology AS degree program (1511080200).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to database systems, software, programming and analysis and design of databases.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 15 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate how to create a database instance.
02.0 Demonstrate how to manage an instance of the database.
03.0 Demonstrate how to maintain Redo log files, and how to use the data dictionary views.
04.0 Demonstrate how to manage tablespaces and datafiles.
05.0 Demonstrate an understanding of database storage structures.
06.0 Demonstrate the ability to query a database.
07.0 Demonstrate how to manage constraints and indexes.
08.0 Demonstrate the ability to perform backups and recovery procedures.
09.0 Demonstrate an understanding of the goals and processes of performance tuning.
10.0 Demonstrate how to automate management tasks, create scheduled jobs, programs, and schedules.
11.0 Demonstrate the ability to efficiently manage space-related inefficiencies of the database.
12.0 Demonstrate the ability to understand a database memory management.
13.0 Demonstrate the ability to set up a database to be deployed globally.

Florida Department of Education
Student Performance Standards

Program Title: **Oracle Certified Database Administrator**
CIP Number: **0511020307**
Program Length: **15 credit hours**

This certificate program is part of the Database Technology AS degree program (1511080200). At the completion of this program, the student will be able to:	
01.0	Demonstrate how to create a database instance. The student will be able to:
01.01	Explain the steps needed to create a database.
01.02	Identify the database administrative tools.
01.03	Configure the initial settings for creating the database.
01.04	Create, start, and stop a database instance.
02.0	Demonstrate how to manage an instance of the database. The student will be able to:
02.01	Create, manage, and use the initialization files.
02.02	Identify the various states of starting an instance.
02.03	Identify the various options available to shutdown an instance.
03.0	Demonstrate how to maintain log files, and how to use the data dictionary views. The student will be able to:
03.01	Explain how the data files, log files, and archive files are linked and work together.
03.02	Maintain and manage the log files.
03.03	Obtain and archive log file information.
03.04	Identify the use and contents of the data dictionary.
03.05	Use the data dictionary to retrieve information about the database.
04.0	Demonstrate how to manage tablespaces and datafiles. The student will be able to:
04.01	Describe the storage hierarchy.
04.02	Differentiate between the logical and physical structures.
04.03	Create many types of tablespaces.
04.04	Configure and viewing storage for tablespaces and datafiles.
04.05	Use and managing undo data.

	04.06 Describe and configuring diagnostic (trace) files.
05.0	Demonstrate an understanding of database storage structures. The student will be able to:
	05.01 Describe and differentiating between the logical and physical structure of the database.
	05.02 List the segment types and their uses.
	05.03 Maintain storage structures with automatic segment – space management.
	05.04 Maintain storage structures manually.
	05.05 Obtain storage structure information.
06.0	Demonstrate the ability to query a database. The student will be able to:
	06.01 Write basic SQL single row, datatype conversion, group, and user-defined functions.
	06.02 Write filtered, sorted, and aggregated queries.
	06.03 Write SQL statements using advanced queries involving joins, subqueries, and other specialized queries.
07.0	Demonstrate how to manage constraints and indexes. The student will be able to:
	07.01 List the different types of indexes, their uses, and constraints.
	07.02 Develop an example of each type of index.
	07.03 Create index-organized tables.
	07.04 Create, modify, and drop constraints.
	07.05 Maintain indexes.
	07.06 Identify unused indexes.
08.0	Demonstrate the ability to perform backup and recovery procedures. The student will be able to:
	08.01 Describe the various types of backups.
	08.02 Explain the different backup options available to the database professional.
	08.03 Perform a backup.
	08.04 Identify the different types of failures that occur in the database.
	08.05 Perform a complete recovery on a database.
	08.06 Perform an incomplete recovery on a database.
	08.07 Demonstrate how to perform a recovery of non-critical files.
09.0	Demonstrate an understanding of the goals and processes of performance tuning. The student will be able to:

	09.01 Describe the job roles in performance tuning.
	09.02 List the steps in the tuning phases.
	09.03 Explain tuning goals and service level agreements.
	09.04 Describe common performance problems.
	09.05 Explain the tuning methodology.
10.0	Demonstrate how to automate management tasks, use diagnostic tools, create scheduled jobs, programs, and schedules. The student will be able to:
	10.01 Use database utilities to create jobs, programs, and schedule tasks.
	10.02 Describe the purpose and use of the diagnostic tools that are available within the database.
	10.03 Use database utilities to view information about job executions and job instances.
	10.04 Use database utilities to perform automatic gathering of optimizer statistics.
	10.05 Use database utilities to automatically gather object statistics to make efficient decisions about execution plans.
11.0	Demonstrate the ability to efficiently manage space-related inefficiencies of the database. The student will be able to:
	11.01 Tune redo writing and archiving operations.
	11.02 Set and modifying thresholds for space usage.
	11.03 Manage tablespace usage to reduce space-related error conditions.
	11.04 Use different storage options to improve the performance of queries.
12.0	Demonstrate the ability to understand database memory management. The student will be able to:
	12.01 Explain the memory structures.
	12.02 Configure memory structures for database efficiency.
13.0	Demonstrate the ability to set up a database to be deployed globally. The student will be able to:
	13.01 Customize language-dependent behavior for the database and individual sessions.
	13.02 Specify different linguistic sorts for queries.
	13.03 Use date-time data types for different time zones.
	13.04 Query data using case-sensitive and accent-insensitive searches.
	13.05 Obtain globalization support configuration information.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Microsoft Certified Database Administrator Certificate**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511020309
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Database Technology AS degree program (1511080200).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to database systems, software, programming and analysis and design of databases.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 15 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate how to design and implement a data warehouse.
02.0 Demonstrate how to extract and transform data.
03.0 Demonstrate how to load data.

Florida Department of Education
Student Performance Standards

Program Title: **Microsoft Certified Database Administrator Certificate**
CIP Number: **0511020309**
Program Length: **15 credit hours**

This certificate program is part of the Database Technology AS degree program (1511080200). At the completion of this program, the student will be able to:	
01.0	Demonstrate how to design and implement a data warehouse. The student will be able to:
	01.01 Design and implement dimensions.
	01.02 Design and implement fact tables.
02.0	Demonstrate how to extract and transform data. The student will be able to:
	02.01 Define connection managers.
	02.02 Design data flow.
	02.03 Implement data flow.
03.0	Demonstrate how to load data. The student will be able to:
	03.01 Design control flow.
	03.02 Implement control flow.
	03.03 Implement data load options.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Web Development Specialist**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511080103
Program Type	College Credit Certificate (CCC)
Program Length	35 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Internet Services Technology AS degree program (1511100400).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to Internet, Intranet, and Extranet environments; installing, configuring, designing and managing Intranet and web-based resources.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 35 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency with Internet structure, organization, and navigation.
02.0 Understand, install and configure computer hardware.
03.0 Perform enterprise architecture-related tasks.
04.0 Perform web design/development activities.
05.0 Perform programming and scripting activities.
06.0 Perform testing/troubleshooting activities.
07.0 Perform website management activities.
08.0 Perform e-commerce-related tasks.
09.0 Demonstrate professional development skills.
10.0 Perform Documentation and Technical reference activities.
11.0 Perform general organizational computing workplace competencies.

Florida Department of Education
Student Performance Standards

Program Title: **Web Development Specialist**
CIP Number: **0511080103**
Program Length: **35 credit hours**

This certificate program is part of the Internet Services Technology AS degree program (1511100400). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
01.01	Describe the origin of the Internet.
01.02	Outline the history of the Internet.
01.03	Describe Internet organization, such as the Internic, domains and requests for comments (RFCs).
01.04	Describe the structure of the Internet.
01.05	Differentiate between the Internet and the WWW.
01.06	Define Internet push technologies, such as e-mail marketing vs. webpage banner advertising.
01.07	Differentiate among an Intranet site, an extranet site, and an Internet site.
01.08	Describe and identify several major ethical and legal issues related to Internet use and how they affect intellectual property rights.
01.09	Describe the World Wide Web (WWW) and identify how it affects personal security and privacy and our society.
01.10	Describe and differentiate between file types and protocols.
01.11	Demonstrate the use of typical remote access mechanisms.
01.12	Describe various sections of a URL.
01.13	Discuss the use of Internet tools and utilities.
02.0	Understand, install and configure computer hardware. The student will be able to:
02.01	Explain the use of binary numbers to represent instructions and data.
02.02	Describe the hardware implications of the use of binary representation of instructions and data.
02.03	Convert numbers among decimal, binary, and hexadecimal representation.
02.04	Perform binary arithmetic.
02.05	Identify various data representation schemes (e.g., ASCII, Unicode).
02.06	Discuss various data types such as signed and unsigned integers and floating point.

	02.07 Identify the major hardware platforms.
	02.08 Describe distinguishing features of the major hardware platforms.
	02.09 Describe the functions of major hardware components of a computer system.
	02.10 Recognize and correctly identify computing hardware components.
	02.11 Describe emerging hardware technologies and discuss their potential impact.
	02.12 Implement proper procedures for handling and safeguarding equipment.
	02.13 Perform preventive maintenance tasks on microcomputer systems.
	02.14 Describe procedures for proper disposal of computer components.
	02.15 Set up and configure systems and peripherals.
	02.16 Set up BIOS.
	02.17 Install and configure storage and I/O device interfaces.
	02.18 Install and configure multimedia devices and interfaces.
	02.19 Install and configure network interface cards.
03.0	Perform enterprise architecture-related tasks. The student will be able to:
	03.01 Describe the Human-Computer Interaction (HCI) factors that impact the design of a webpage and website.
	03.02 Determine the purpose of establishing a website.
	03.03 Identify the intended audience that will access a website.
	03.04 Determine user needs including secondary applications including database needs and select appropriate applications.
	03.05 Identify business processes to be automated.
	03.06 Determine client specifications.
	03.07 Determine design standards based on intended audience.
	03.08 Define architecture specifications taking into account constraints (e.g., bandwidth).
	03.09 Establish performance standards and set baseline.
	03.10 Determine security standards that will meet business requirements.
	03.11 Install and configure system based on planning.
04.0	Perform web design/development activities. The student will be able to:
	04.01 Describe and use the process of storyboarding a website.

	04.02 Describe format, structure and design principles for websites.
	04.03 Evaluate web graphic utilities and creation tools, including those for animated graphics.
	04.04 Identify existing resources and constraints.
	04.05 Evaluate design based on current industry and in-house standards.
	04.06 Create site navigation plan including directory structure.
	04.07 Procure/create and incorporate standard and animated graphics into a webpage.
	04.08 Obtain in-house content and determine needs for secondary content providers.
	04.09 Design page templates to implement on final site.
	04.10 Create a webpage using authoring tools.
	04.11 Code page(s) using current web programming languages.
	04.12 Check page for cross-browser capability and other access issues.
	04.13 Upload pages and run site analysis.
	04.14 Incorporate sound files onto a webpage.
	04.15 Incorporate a streaming video file onto a webpage.
	04.16 Incorporate a video file for download into a webpage.
	04.17 Create an animated graphic.
	04.18 Perform simple graphic modifications using a graphics utility.
	04.19 Incorporate an e-mail link on a webpage.
	04.20 Incorporate internal and external links on a webpage.
	04.21 Incorporate tables and file transfer capabilities on a webpage.
	04.22 Incorporate handicapped-accessibility options into the website.
	04.23 Configure a webpage for Search Engine Optimization.
	04.24 Create a web form and produce e-mail results.
	04.25 Create a web database interface.
	04.26 Discuss the issue of ODBC compliance.
05.0	Perform programming and scripting activities. The student will be able to:
	05.01 Identify several of the most prominent current programming languages.

05.02	Characterize the stages of the system development life cycle.
05.03	Differentiate between two common strategies for problem solving.
05.04	Describe the program design and development process.
05.05	Differentiate between structured programming and object-oriented programming.
05.06	Use procedural and object-oriented constructs of programming, scripting, and/or macro languages to create and test programs.
05.07	Apply principles of good design and documentation when developing programs.
05.08	Write scripting code to handle error checking in client forms.
05.09	Write CGI programs to allow for interactions between the client and server.
05.10	Use scripting languages to create dynamic webpages.
05.11	Identify development tools and list in order of complexity of use.
05.12	Design, review, and test specifications and algorithms.
05.13	Write program according to specifications and revise based on testing and debugging.
06.0	Perform testing/troubleshooting activities. The student will be able to:
06.01	Describe the use of diagnostic test equipment.
06.02	Describe features of diagnostic software.
06.03	Use system, software, and network documentation.
06.04	Locate and use online documentation resources.
06.05	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
06.06	Recognize and resolve basic hardware, software configuration, and peripheral device problems.
06.07	Use effective troubleshooting strategies and techniques to resolve network problems, including network interfaces, cabling, or other network components (hubs, switches).
06.08	Describe appropriate procedures and techniques for disaster prevention and recovery (surge suppressors, UPS, use of anti-virus software, replacement equipment plans, backups of software and data, offsite storage of backup media).
06.09	Describe appropriate security procedures and practices, including physical security and protection of resources through software measures (passwords, antivirus software, data encryption).
06.10	Develop testing plan and procedures.
06.11	Develop a system baseline.
06.12	Perform capacity testing against system baseline.
06.13	Evaluate network, database and server performance based on test outcomes.

	06.14 Evaluate client performance based on test outcomes.
	06.15 Assess accessibility standards.
	06.16 Evaluate security system.
	06.17 Conduct ongoing systems analysis and revise system as needed.
	06.18 Discuss obtaining final client approval for implementation and system changes.
07.0	Perform website management activities. The student will be able to:
	07.01 Describe the process of obtaining a domain address.
	07.02 Notify appropriate external search engines of the website.
	07.03 Compare features of currently available site management tools.
	07.04 Install and configure website management software.
	07.05 Create and maintain a website using a web management tool.
	07.06 Implement appropriate website security measures.
	07.07 Use and evaluate the results of a website visit-recording tool.
08.0	Perform e-commerce-related tasks. The student will be able to:
	08.01 Describe web e-commerce.
	08.02 Analyze e-commerce models.
	08.03 Develop e-commerce business and marketing plan.
	08.04 Identify components and procedures necessary to process credit card transactions including any security measures.
	08.05 Demonstrate an understanding of the credit card transaction process.
	08.06 Implement shopping cart software.
	08.07 Set up and configure online catalog to market products.
	08.08 Establish transaction storage and reporting system.
	08.09 Publish website.
09.0	Demonstrate professional development skills. The student will be able to:
	09.01 Identify corporate strategies and policies.
	09.02 Maintain professional contact for future projects.
	09.03 Build mentor relationships.

	09.04 Anticipate future industry trends.
	09.05 Utilize life-long learning skills.
	09.06 Review and analyze other industry productions.
	09.07 Use and experiment with the technology.
	09.08 Network with local professionals in the industry.
	09.09 Read industry journals and magazines.
	09.10 Attend seminars, workshops, and tradeshows.
10.0	Perform Documentation and Technical reference activities. The student will be able to:
	10.01 Use technical vocabulary appropriately.
	10.02 Locate information in technical references.
	10.03 Prepare technical reports.
	10.04 Describe appropriate documentation procedures and practices.
	10.05 Effectively use locally maintained systems, software, and network documentation.
	10.06 Produce and maintain system documentation, such as inventory, costs, installed software, and procedures.
	10.07 Demonstrate proficiency with Internet structure, organization, and navigation.
	10.08 Maintain visual network documentation, such as cabling diagrams.
	10.09 Describe effective strategies to locate and evaluate technical information online.
	10.10 Cite correctly Internet-based resources.
11.0	Perform general organizational computing workplace competencies. The student will be able to:
	11.01 Follow oral and written instructions.
	11.02 Prepare, outline, and deliver a short oral presentation, including visual aids.
	11.03 Participate in group discussion as a member and as a leader.
	11.04 Obtain appropriate information from graphics, maps, or signs.
	11.05 Demonstrate self-motivation and responsibility to complete an assigned task.
	11.06 List the steps in solving a problem.
	11.07 Choose appropriate action in situations requiring effective time management.
	11.08 Identify and discuss issues contained within professional codes of conduct.

11.09	Identify and discuss property rights and licensing issues.
11.10	Identify and discuss privacy issues.
11.11	Identify and discuss encryption issues.
11.12	Identify legal liability issues.
11.13	Describe appropriate measures for planning and managing a large project.
11.14	Define an implementation schedule for a large project.
11.15	Describe appropriate measures for planning and implementing corporate wide upgrade of hardware and software.
11.16	Identify potential sources of employee/employer or employee/employer conflict and discuss possible approaches to resolve such disagreements.
11.17	Use appropriate communication skills, courtesy, manners, and dress in the workplace.
11.18	Apply principles and techniques for being a productive, contributing member of a team.
11.19	Identify and use acceptable strategies for resolving conflict in the workplace.
11.20	Apply principles and techniques for working productively with people of diverse cultures and backgrounds.
11.21	Identify techniques for stress management and prevention of job burn-out.
11.22	Use appropriate communication skills, telephone etiquette, courtesy, and manners when dealing with customers.
11.23	Communicate effectively with individuals lacking a technical background.
11.24	Identify examples of effective end-user training strategies and techniques.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Server Administration**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100112
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency in basic computer maintenance and support.
02.0 Explain and apply fundamental concepts of computer networking.
03.0 Describe common operating systems deployments and associated practices
04.0 Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards.
05.0 Demonstrate knowledge of the directory services infrastructure and installation.
06.0 Demonstrate an understanding of group policy.
07.0 Demonstrate an understanding of implementing sites to manage Active Directory replication.
08.0 Demonstrate an understanding of maintaining Active Directory services availability.
09.0 Install and deploy a server operating system.
10.0 Demonstrate provision of infrastructure services.
11.0 Demonstrate how to provide file and print services.
12.0 Demonstrate how to provide remote and wireless network access.
13.0 Demonstrate how to monitor and maintain network servers and services.
14.0 Implement secure data transmission and authentication.
15.0 Explain the process of planning for business continuity and high availability.
16.0 Demonstrate workplace-readiness skills.

Florida Department of Education
Student Performance Standards

Program Title: **Network Server Administration**
CIP Number: **0511100112**
Program Length: **24 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in basic computer maintenance and support. The student will be able to:
01.01	Describe the main computer components and their functions.
01.02	Describe the operation of computer systems, including input and output systems, file systems, device management, program loading, execution and data storage.
01.03	Explain and demonstrate the safe and ethical use of computers.
01.04	Describe and identify proficiency in connecting to and safely using the Internet.
01.05	Describe emerging computer technologies and discuss their potential impact.
01.06	Implement proper procedures for handling and safeguarding equipment.
01.07	Describe procedures for proper disposal of computer components.
01.08	Install, configure, maintain and secure computer systems and peripherals following institutional protocol.
01.09	Explain the procedures for updating firmware and ROM-BIOS on PCs and Laptops.
01.10	Implement work order procedures.
01.11	Design and implement systems redundancy and data backups.
01.12	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
01.13	List the steps in problem solving.
01.14	Recognize and resolve basic computer configuration problems.
01.15	Identify and summarize 5 major Hive Keys of the Windows Registry.
02.0	Explain and apply fundamental concepts of computer networking. The student will be able to:
02.01	Explain the use of binary numbers and perform related binary and hexadecimal arithmetic.
02.02	Describe current network environments.
02.03	Describe network communications and architecture.
02.04	Identify network components, media, connectors, applications and protocols.

	02.05	Compare and contrast the OSI and TCP/IP reference models and explain their stop/down encapsulation process.
	02.06	Identify and describe current relevant IEEE network standards.
	02.07	Explain a class 'C' network using a classful and classless routing scheme.
	02.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
	02.09	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
	02.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
	02.11	Describe the major functions of LAN protocols.
	02.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
	02.13	Configure and explain TCP/IP protocol stack.
	02.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
	02.15	Identify emerging technologies and discuss related technical issues.
	02.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
	02.17	State the functionality and purpose of Virtual Local Area Networks (VLANS).
	02.18	Identify and explain wide area network (WAN) concepts.
	02.19	Plan, configure and test a small network and establish baselines.
	02.20	Describe the major functions of network server software components.
	02.21	Install applications on a server and configure clients for network access.
03.0	Describe common operating systems deployments and associated practices. The student will be able to:	
	03.01	Compare and describe the components and functions of major operating systems.
	03.02	Explain the functions, features and differences of Active Directory and Directory Services.
	03.03	Install, configure and update client and server operating systems.
	03.04	Describe the purpose and uses of computer virtualization.
	03.05	Manage device drivers and software for peripheral devices.
	03.06	Manage the network and firewall settings of a client.
	03.07	Use an operating system for activities such as data and file management.
	03.08	Identify current systems utilities and describe their functions.
	03.09	Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.

	03.10 Create, use, maintain, backup and restore system configuration files.
	03.11 Restate the correct procedure/s for uninstalling operating system software.
	03.12 Install and configure client software for connecting to LANs, WANs, and the Internet.
	03.13 Demonstrate knowledge of basic troubleshooting methodology.
04.0	Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards. The student will be able to:
	04.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	04.02 Define and describe malicious software and techniques to protect systems from its effects.
	04.03 Explain the difference between an on-path attack vs an on-network attack, and how to mitigate them both.
	04.04 Explain the use of the 5x5 risk matrix tool and where it is commonly used.
	04.05 Describe the principles and techniques of securing data storage and transmission.
	04.06 Explain the current encryption and authentication standards.
	04.07 Describe security policies, including compliance and operational security.
	04.08 Configure access control, identity management and security logging.
	04.09 Describe client and network system security software and related updates.
	04.10 Explain the differences between software and hardware firewalls and where they are used.
	04.11 Demonstrate the use of Command Line Interface (CLI) troubleshooting tools.
	04.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	04.13 Describe the purpose and operation of network protocol analyzers.
	04.14 Demonstrate the network use of Wireshark; Nmap, and evaluate Nmap results.
	04.15 Demonstrate critical thinking skills during network security troubleshooting.
05.0	Demonstrate knowledge of the directory services infrastructure and installation. The student will be able to:
	05.01 Describe the architecture of Active Directory.
	05.02 Discuss how Active Directory works.
	05.03 Describe the Active Directory design, plan, and implementation processes.
	05.04 Create a forest and domain structure.
	05.05 Configure the Domain Name Service (DNS) in an Active Directory environment.
	05.06 Raise the functional level of a forest and a domain.

	05.07 Create trust relationships between domains.
	05.08 Create, manage, and delegate administrative control for organizational units.
06.0	Demonstrate an understanding of group policy. The student will be able to:
	06.01 Create and configure group policy objects (GPOs).
	06.02 Configure group policy refresh rates and group policy settings.
	06.03 Manage GPOs.
	06.04 Verify and troubleshoot group policy.
	06.05 Delegate administrative control of group policy.
	06.06 Plan a group policy strategy for the enterprise.
	06.07 Configure, deploy and maintain applications using group policy.
	06.08 Monitor and maintain security policies.
	06.09 Prepare and implement group policy strategy and backup/recovery of group policy objects.
07.0	Demonstrate an understanding of implementing sites to manage Active Directory replication. The student will be able to:
	07.01 Discuss directory services replication.
	07.02 Design and document site topology.
	07.03 Manage site topology.
	07.04 Troubleshoot replication failures.
	07.05 Plan, create and configure a site.
	07.06 Implement the global catalog in Active Directory.
	07.07 Plan and determine the placement and type of domain controllers in Active Directory.
	07.08 Identify the various Operations Master Roles and Global Catalog.
	07.09 Plan the placement of Operations Masters and Global Catalog.
	07.10 Transfer and seize Operations Master Roles.
08.0	Demonstrate an understanding of maintaining Active Directory services availability. The student will be able to:
	08.01 Create an Active Directory implementation plan for a business enterprise.
	08.02 Implement the Active Directory infrastructure for a business enterprise.
	08.03 Describe the maintenance of the Active Directory.

	08.04 Move and defragment an Active Directory database.
	08.05 Backup and restore an Active Directory.
	08.06 Monitor an Active Directory.
09.0	Install and deploy a server operating system. The student will be able to:
	09.01 Identify server operating system (OS) versions, editions, features and capabilities.
	09.02 Assess server installation readiness by inventorying hardware.
	09.03 Describe the methods, options and requirements for a Windows server installation and upgrade.
	09.04 Perform an attended and an unattended OS installation.
	09.05 Configure basic network settings.
	09.06 Configure storage.
	09.07 Configure operating systems licensing.
	09.08 Describe, identify and choose server roles and role services.
	09.09 Perform a system review and troubleshoot installation issues.
	09.10 Document the system installation.
	09.11 Automate server deployments using unattended installation tools and Windows.
	09.12 Implement deployment services.
10.0	Demonstrate provision of infrastructure services. The student will be able to:
	10.01 Describe the purpose and function of Dynamic Host Configuration Protocol (DHCP).
	10.02 Install, configure, and authorize the DHCP server role.
	10.03 Manage, backup and restore the DHCP Database.
	10.04 Configure the DHCP Relay Agent.
	10.05 Describe the DNS name resolution process.
	10.06 Configure DNS zones, records and replication.
	10.07 Integrate DNS servers with Active Directory.
	10.08 Configure name resolution for client computers.
11.0	Demonstrate how to provide file and print services. The student will be able to:
	11.01 Design a file sharing strategy.

	11.02 Install the file and print server roles and services.
	11.03 Manage file sharing security, encryption, redundancy, and offline access.
	11.04 Manage disk quotas, file screening and shadow copy services.
	11.05 Backup and restore files.
	11.06 Configure Distributed File System (DFS) roots, targets and replication.
	11.07 Identify and install print drivers.
	11.08 Manage printer security, priorities, schedules and pools.
	11.09 Publish printers and file shares to Active Directory.
	11.10 Monitor and troubleshoot print and file services.
12.0	Demonstrate how to provide remote and wireless network access. The student will be able to:
	12.01 Compare and contrast remote access protocols, wireless standards and network authentication methods.
	12.02 Configure static and dynamic routing, Network Address Translation (NAT).
	12.03 Configure remote access services, protocols and policies, conditions and settings.
	12.04 Configure Remote Access Dial-In User Service (RADIUS).
13.0	Demonstrate how to monitor and maintain network servers and services. The student will be able to:
	13.01 Monitor and compare network and server performance data to establish and document baselines, isolate problems and optimize performance, adaptability, and scalability.
	13.02 Optimize traffic flow conditions on network connections based on analysis of traffic types, characteristics and user needs.
	13.03 Monitor event logs for information, errors and warnings.
	13.04 Maintain system documentation and service histories.
	13.05 Configure server and client settings to implement patch management strategy.
	13.06 Develop strategies for remote server management using command-line and GUI tools.
14.0	Implement secure data transmission and authentication. The student will be able to:
	14.01 Explain the social, ethical and technical issues regarding data integrity and confidentiality.
	14.02 Secure network traffic using IPSec.
	14.03 Configure network authentication.
	14.04 Install, configure and manage certificate services.
	14.05 Describe and deploy a network access protection strategy.

	14.06 Configure firewall settings.
	14.07 Identify ports and protocols and create filters for incoming and outgoing traffic.
15.0	Explain the process of planning for business continuity and high availability. The student will be able to:
	15.01 Discuss virtualization architectures.
	15.02 Estimate data storage requirements.
	15.03 Select a storage technology.
	15.04 Plan for storage fault tolerance.
	15.05 Develop strategies to ensure application and service availability.
	15.06 Differentiate and apply static and dynamic routing.
16.0	Demonstrate workplace-readiness skills. The student will be able to:
	16.01 Explain the value of proper communication in the classroom and workplace environment.
	16.02 Participate in group discussions as a member and as a leader.
	16.03 Explain the importance of self-motivation and responsibility in completing assigned tasks.
	16.04 Choose appropriate actions in situations requiring effective time management.
	16.05 Apply principles and techniques for being a productive, contributing member of a team.
	16.06 Discuss the ethical aspects of intellectual property rights and licensing issues.
	16.07 Identify and discuss issues contained within professional codes of conduct.
	16.08 Describe appropriate communication skills, courtesy, manners, and dress in the workplace.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Enterprise Administration**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100113
Program Type	College Credit Certificate (CCC)
Program Length	32 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 32 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency in basic computer network maintenance and support.
02.0 Explain and apply fundamental concepts of computer networking.
03.0 Describe common operating systems deployments and associated practices.
04.0 Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards.
05.0 Demonstrate knowledge of the directory services infrastructure and installation.
06.0 Demonstrate an understanding of group policy.
07.0 Demonstrate an understanding of implementing sites to manage Active Directory replication.
08.0 Demonstrate an understanding of maintaining Active Directory services availability.
09.0 Install and deploy a server operating system.
10.0 Demonstrate provision of infrastructure services.
11.0 Demonstrate how to provide file and print services.
12.0 Demonstrate how to provide remote and wireless network access.
13.0 Demonstrate how to monitor and maintain network servers and services.
14.0 Implement secure data transmission and authentication.
15.0 Explain the process of planning for business continuity and high availability.
16.0 Demonstrate workplace-readiness skills.

Florida Department of Education
Student Performance Standards

Program Title: **Network Enterprise Administration**
CIP Number: **0511100113**
Program Length: **29 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in basic computer network maintenance and support. The student will be able to:
01.01	Describe the main computer components and their functions.
01.02	Describe the operation of computer systems, including input and output systems, file systems, device management, program loading execution and data storage.
01.03	Explain and demonstrate the safe and ethical use of computers.
01.04	Demonstrate proficiency in connecting to and safely using the Internet.
01.05	Describe emerging computer technologies and discuss their potential impact.
01.06	Implement proper procedures for handling and safeguarding equipment.
01.07	Describe procedures for proper disposal of computer components.
01.08	Install, configure, maintain and secure computer systems and peripherals following institutional protocol.
01.09	Explain the procedures for updating firmware and ROM-BIOS on PCs and Laptops.
01.10	Implement work order procedures.
01.11	Design and implement systems redundancy and data backups.
01.12	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
01.13	List the steps in problem solving.
01.14	Recognize and resolve basic computer configuration problems.
02.0	Explain and apply fundamental concepts of computer networking. The student will be able to:
02.01	Explain the use of binary numbers and perform binary arithmetic.
02.02	Describe current network environments.
02.03	Describe network communications and architecture.
02.04	Identify network components, media, connectors, applications and protocols.
02.05	Compare and contrast the OSI and TCP/IP reference models and explain their stop/down encapsulation process.

	02.06	Identify and describe current relevant IEEE network standards.
	02.07	Explain a class ‘C’ network using a classful and classless routing scheme.
	02.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
	02.09	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
	02.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
	02.11	Describe the major functions of LAN protocols.
	02.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
	02.13	Configure and explain the TCP/IP protocol stack.
	02.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
	02.15	Identify emerging technologies and discuss related technical issues.
	02.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
	02.17	State the functionality and purpose of Virtual Local Area Networks (VLANS).
	02.18	Identify and explain wide area network (WAN) concepts.
	02.19	Plan, configure and test a small network and establish baselines.
	02.20	Describe the major functions of network server software components.
	02.21	Install applications on a server and configure clients for network access.
03.0	Describe common operating systems deployments and associated practices. The student will be able to:	
	03.01	Compare and describe the components and functions of major operating systems.
	03.02	Explain the functions, features, and differences of Active Directory and Directory Services.
	03.03	Install, configure and update client and server operating systems.
	03.04	Describe the purpose and uses of computer virtualization.
	03.05	Manage device drivers and software for peripheral devices.
	03.06	Manage the network and firewall settings of a client.
	03.07	Use an operating system for activities such as data and file management.
	03.08	Identify current systems utilities and describe their functions.
	03.09	Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.
	03.10	Create, use, maintain, backup and restore system configuration files.

	03.11 Restate the correct procedure/s for uninstalling operating system software.
	03.12 Install and configure client software for connecting to LANs, WANs, and the Internet.
	03.13 Demonstrate knowledge of basic troubleshooting methodology.
04.0	Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards. The student will be able to:
	04.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	04.02 Define and describe malicious software and techniques to protect systems from its effects.
	04.03 Explain the difference between an on-path attach vs. an on-network attack, and how to mitigate them both.
	04.04 Explain the use of 5x5 risk matrix tool and where it is commonly used.
	04.05 Describe the principles and techniques of securing data storage and transmission.
	04.06 Explain the current encryption and authentication standards.
	04.07 Describe security policies, including compliance and operational security.
	04.08 Configure access control, identity management and security logging.
	04.09 Manage client and network system security software and related updates.
	04.10 Explain the differences between software and hardware firewalls and where they are used.
	04.11 Demonstrate the use of Command Line Interface (CLI) troubleshooting tools.
	04.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	04.13 Describe the purpose and operation of network protocol analyzers.
	04.14 Demonstrate critical thinking skills during network and security troubleshooting.
05.0	Demonstrate knowledge of the directory services infrastructure and installation. The student will be able to:
	05.01 Describe the architecture of Active Directory.
	05.02 Discuss how Active Directory works.
	05.03 Describe the Active Directory design, plan, and implementation processes.
	05.04 Create a forest and domain structure.
	05.05 Configure the Domain Name Service (DNS) in an Active Directory environment.
	05.06 Raise the functional level of a forest and a domain.
	05.07 Create trust relationships between domains.
	05.08 Create, manage, and delegate administrative control for organizational units.

06.0	Demonstrate an understanding of group policy. The student will be able to:
06.01	Create and configure group policy objects (GPOs).
06.02	Configure group policy refresh rates and group policy settings.
06.03	Manage GPOs.
06.04	Verify and troubleshoot group policy.
06.05	Delegate administrative control of group policy.
06.06	Plan a group policy strategy for the enterprise.
06.07	Configure, deploy and maintain applications using group policy.
06.08	Monitor and maintain security policies.
06.09	Prepare and implement group policy strategy and backup/recovery of group policy objects.
07.0	Demonstrate an understanding of implementing sites to manage Active Directory replication. The student will be able to:
07.01	Discuss directory services replication.
07.02	Design and document site topology.
07.03	Manage site topology.
07.04	Troubleshoot replication failures.
07.05	Plan, create and configure a site.
07.06	Implement the global catalog in Active Directory.
07.07	Plan and determine the placement and type of domain controllers in Active Directory.
07.08	Identify the various Operations Master Roles and Global Catalog.
07.09	Plan the placement of Operations Masters and Global Catalog.
07.10	Transfer and seize Operations Master Roles.
08.0	Demonstrate an understanding of maintaining Active Directory services availability. The student will be able to:
08.01	Create an Active Directory implementation plan for a business enterprise.
08.02	Implement the Active Directory infrastructure for a business enterprise.
08.03	Describe the maintenance of the Active Directory.
08.04	Move and defragment an Active Directory database.
08.05	Backup and restore an Active Directory.

	08.06 Monitor an Active Directory.
09.0	Install and deploy a server operating system. The student will be able to:
	09.01 Identify server operating system (OS) versions, editions, features and capabilities.
	09.02 Assess server installation readiness by inventorying hardware.
	09.03 Describe the methods, options and requirements for a Windows server installation and upgrade.
	09.04 Perform an attended and an unattended OS installation.
	09.05 Configure basic network settings.
	09.06 Configure storage.
	09.07 Configure operating systems licensing.
	09.08 Describe, identify and choose server roles and role services.
	09.09 Perform a system review and troubleshoot installation issues.
	09.10 Document the system installation.
	09.11 Automate server deployments using unattended installation tools and Windows.
	09.12 Implement deployment services.
10.0	Demonstrate provision of infrastructure services. The student will be able to:
	10.01 Describe the purpose and function of Dynamic Host Configuration Protocol (DHCP).
	10.02 Install, configure, and authorize the DHCP server role.
	10.03 Manage, backup and restore the DHCP Database.
	10.04 Configure the DHCP Relay Agent.
	10.05 Describe the DNS name resolution process.
	10.06 Configure DNS zones, records and replication.
	10.07 Integrate DNS servers with Active Directory.
	10.08 Configure name resolution for client computers.
11.0	Demonstrate how to provide file and print services. The student will be able to:
	11.01 Design a file sharing strategy.
	11.02 Install the file and print server roles and services.
	11.03 Manage file sharing security, encryption, redundancy, and offline access.

	11.04 Manage disk quotas, file screening and shadow copy services.
	11.05 Backup and restore files.
	11.06 Configure Distributed File System (DFS) roots, targets and replication.
	11.07 Identify and install print drivers.
	11.08 Manage printer security, priorities, schedules and pools.
	11.09 Publish printers and file shares to Active Directory.
	11.10 Monitor and troubleshoot print and file services.
12.0	Demonstrate how to provide remote and wireless network access. The student will be able to:
	12.01 Compare and contrast remote access protocols, wireless standards and network authentication methods.
	12.02 Configure static and dynamic routing, Network Address Translation (NAT).
	12.03 Configure remote access services, protocols and policies, conditions and settings.
	12.04 Configure Remote Access Dial-In User Service (RADIUS).
	12.05 Configure wireless clients with Group Policy.
	12.06 Monitor and troubleshoot remote access and wireless connections.
13.0	Demonstrate how to monitor and maintain network servers and services. The student will be able to:
	13.01 Monitor and compare network and server performance data to establish and document baselines, isolate problems and optimize performance, adaptability, and scalability.
	13.02 Optimize traffic flow conditions on network connections based on analysis of traffic types, characteristics and user needs.
	13.03 Monitor event logs for information, errors and warnings.
	13.04 Maintain system documentation and service histories.
	13.05 Configure server and client settings to implement patch management strategy.
	13.06 Develop strategies for remote server management using command-line and GUI tools.
14.0	Implement secure data transmission and authentication. The student will be able to:
	14.01 Explain the social, ethical and technical issues regarding data integrity and confidentiality.
	14.02 Secure network traffic using IPSec.
	14.03 Configure network authentication.
	14.04 Install, configure and manage certificate services.
	14.05 Describe and deploy Network Access Protection strategy.

	14.06 Configure firewall settings.
	14.07 Identify ports and protocols and create filters for incoming and outgoing traffic.
15.0	Explain the process of planning for business continuity and high availability. The student will be able to:
	15.01 Discuss virtualization architectures.
	15.02 Estimate data storage requirements.
	15.03 Select a storage technology.
	15.04 Plan for storage fault tolerance.
	15.05 Develop strategies to ensure application and service availability.
	15.06 Plan for backup and recovery of data, servers, and directory services.
16.0	Demonstrate workplace-readiness skills. The student will be able to:
	16.01 Explain the value of proper communication in the classroom and workplace environment.
	16.02 Participate in group discussions as a member and as a leader.
	16.03 Explain the importance of self-motivation and responsibility in completing assigned tasks.
	16.04 Choose appropriate actions in situations requiring effective time management.
	16.05 Apply principles and techniques for being a productive, contributing member of a team.
	16.06 Discuss the ethical aspects of intellectual property rights and licensing issues.
	16.07 Identify and discuss issues contained within professional codes of conduct.
	16.08 Describe appropriate communication skills, courtesy, manners, and dress in the workplace.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Infrastructure**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100114
Program Type	College Credit Certificate (CCC)
Program Length	21 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112) and is aligned with the Cisco Certified Network Associate (CCNA) industry certification.

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 21 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Explain and apply fundamental concepts of computer networking.
02.0 Describe routing concepts.
03.0 Demonstrate router configuration skills.
04.0 Explain LAN desgin and concepts.
05.0 Demonstrate VLAN configuration skills.
06.0 Describe WAN protocols and technologies.
07.0 Demonstrate WAN configuration skills.
08.0 Demonstrate an understanding of network security.
09.0 Describe remote access options.
10.0 Describe and implement IP addressing services.
11.0 Demonstrate an understanding of network maintenance, support and troubleshooting.

Florida Department of Education
Student Performance Standards

Program Title: **Network Infrastructure**
CIP Number: **Information Technology**
Program Length: **21 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Explain and apply fundamental concepts of computer networking. The student will be able to:
01.01	Explain the use of binary numbers and perform related binary and hexadecimal arithmetic.
01.02	Describe current network environments.
01.03	Describe network communications and architecture.
01.04	Identify network components, media, connectors, applications and protocols.
01.05	Compare and contrast the OSI and TCP/IP reference models and their layers.
01.06	Identify and describe current relevant IEEE network standards.
01.07	Explain a class ‘C’ network using a classful and classless routing scheme.
01.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
01.09	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
01.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
01.11	Describe the major functions of LAN protocols.
01.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
01.13	Configure and explain the TCP/IP protocol stack.
01.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
01.15	Identify emerging technologies and discuss related technical issues.
01.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
01.17	State the functionality and purpose of Virtual Local Area Networks (VLANS).
01.18	Identify and explain wide area network (WAN) concepts.
01.19	Plan, configure and test a small network and establish baselines.
01.20	Describe the major functions of network server software components.

	01.21 Install applications on a server and configure clients for network access.
02.0	Describe routing concepts. The student will be able to:
	02.01 Differentiate between routing and routable protocols.
	02.02 Identify the hardware and software components of routers.
	02.03 Explain the purpose and nature of routing tables.
	02.04 Describe administrative distance and routing metrics such as hop counts and cost.
	02.05 Explain how a router determines a path and forwards or drops a packet.
	02.06 Differentiate between static and dynamic routing.
	02.07 Explain the differences between class-full and classless routing.
	02.08 Describe the use and operation of VLSM and CIDR.
	02.09 Describe how a network converges.
03.0	Demonstrate router configuration skills. The student will be able to:
	03.01 Configure and verify router interfaces.
	03.02 Perform basic router configuration using the Command Line Interface (CLI) to inspect the operations of the router.
	03.03 Design and implement a classless IP addressing scheme for a network.
	03.04 Describe a router for RIP version 2 operation.
	03.05 Use advanced configuration commands with routers.
	03.06 Configure a router for OSPF routing in a network.
	03.07 Fine-tune OSPF settings on a router, including the configuration of reference bandwidth, redistribution of static and default routes, and modification of OSPF intervals, in order to optimize network performance.
	03.08 Verify and troubleshoot router operations in an OSPF network.
	03.09 Configure and modify metric on a router to improve network performance.
	03.10 Configure summarization and default route settings on a router to optimize network performance.
	03.11 Verify and troubleshoot router operations in complex network environment.
04.0	Explain LAN design and concepts. The student will be able to:
	04.01 Identify the layers and functions of switched network architecture.
	04.02 Describe the principles and benefits of a hierarchical network design.
	04.03 Explain the technology and media access control method for Ethernet networks.

	04.04	Describe the issues associated with Layer 2.
	04.05	Describe the operation of a LAN switch.
	04.06	Describe the benefits of Virtual Local Area Networks (VLAN).
	04.07	Identify and describe the different VLAN encapsulation protocols and their operation.
	04.08	Describe the purpose and operation of VLAN Trunking Protocol (VTP) in the management of a switched network domain.
	04.09	Describe the purpose and operation of Spanning Tree Protocol (STP), and its variants.
	04.10	Describe the use of Inter-VLAN routing to connect different Networks in a switch-based network topology.
	04.11	Analyze business requirements and design a LAN structure to meet those requirements.
	04.12	Discuss quality-of-service considerations and switching prioritization.
05.0	Demonstrate VLAN configuration skills. The student will be able to:	
	05.01	Perform and verify initial LAN switch configuration tasks including remote access management, switch port modes, and trunks.
	05.02	Configure, verify, and troubleshoot VLANs on a LAN switch.
	05.03	Implement a VLAN Domain by configuring LAN switches for VTP network operation.
	05.04	Configure a router to provide Inter-VLAN routing using multiple physical interfaces, and on a single physical interface with sub-interfaces.
	05.05	Configure and troubleshoot STP and its variants on a switched network environment.
	05.06	Configure and verify the bridge to optimize STP.
	05.07	Establish and configure port priorities.
	05.08	Troubleshoot and resolve issues with STP operations.
	05.09	Manage router and switch OS software.
06.0	Describe WAN protocols and technologies. The student will be able to:	
	06.01	Describe WAN and MAN topologies.
	06.02	Differentiate between WAN and LAN topologies.
	06.03	Identify and describe WAN protocols.
	06.04	Describe the impact of applications (Voice Over IP, Video Over IP) on a network.
	06.05	Identify major network issues associated with the Internet, intranets and extranets.
	06.06	Explain the differences between the use of leased lines, packet-switched, and circuit-switched technologies.
	06.07	Describe typical WAN links and discuss bandwidth considerations.

	06.08 Identify and manage licensing.
07.0	Demonstrate WAN configuration skills. The student will be able to:
	07.01 Configure and verify Point-to-Point WAN connection.
	07.02 Configure and verify a packet switched WAN connection.
	07.03 Configure and verify a basic WAN serial connection and PPP connection between routers.
	07.04 Configure and verify a PPP connection between routers.
	07.05 Troubleshoot WAN implementation issue.
	07.06 Implement LAN/WAN connections, including virtual private networks (VPN) and tunneling.
08.0	Demonstrate an understanding of network security. The student will be able to:
	08.01 Implement basic switch security measures such as port security, trunk access, and management VLANs.
	08.02 Identify current network security threats and explaining how to implement a comprehensive security policy to mitigate common threats to network devices, hosts, and applications.
	08.03 Describe the functions of common security appliances and applications.
	08.04 Implement recommended security practices to secure network devices.
	08.05 Discuss the functions of authentication servers.
	08.06 Describe the function and use of Access Control Lists (ACLs).
	08.07 Verify, monitor, and troubleshoot ACLs in a network environment.
09.0	Describe remote access options. The student will be able to:
	09.01 Compare and contrast remote access protocols, wireless standards and network authentication methods.
	09.02 Configure static and dynamic routing and Network Address Translation (NAT).
	09.03 Configure remote access services, protocols and policies, conditions and settings.
	09.04 Implement Remote Access Dial-In User Service (RADIUS).
	09.05 Monitor and troubleshoot remote access.
10.0	Describe and implement IP addressing services. The student will be able to:
	10.01 Describe the purpose and operation of DHCP and DNS in a networked environment.
	10.02 Configure, verify, and troubleshoot DHCP and DNS operations on a router.
	10.03 Describe the operation and use of NAT and Port Address Translation (PAT) to provide Internet access to Private IP Address networks.
	10.04 Configure, verify, and troubleshoot NAT on a router, including static translation, use of IP Address pools, and sharing a public IP

		address on a router interface.
	10.05	Explain the abbreviating rules, purpose and operation of IPv6.
	10.06	Configure, verify, and troubleshoot Ipv4 and IPv6 routing in a network.
11.0	Demonstrate an understanding of network maintenance, support and troubleshooting. The student will be able to:	
	11.01	Identify, interpret and maintain network documentation, procedures and practices.
	11.02	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
	11.03	Follow standard operating procedures for troubleshooting hardware and software.
	11.04	Manage, maintain and backup router and switch system and configuration files.
	11.05	Recognize and resolve hardware and software configuration problems.
	11.06	Identify and explain resolution of common network problems found on layers 1 through 7 of the Open Systems Interconnection (OSI) model.
	11.07	Determine type of programs and procedures required to: baseline network performance, identify intrusion and unacceptable system use, identify performance issues, predict system failures, and optimize network availability.
	11.08	Inspect and evaluate malicious and suspicious activities via logs, Intrusion Detection Systems, software and appliances.
	11.09	Describe various attack vectors to a network and the threat mitigation techniques that protect those vectors.
	11.10	Explain how SIEM, SOAR, an AI is used in today's networks for automation and threat detection.
	11.11	Explain the basics of the MITRE ATT&CK framework, the Diamond Model, and the Cyber Kill Chain and how these intrusion analysis models are used.
	11.12	Describe how Security Onion is used to train security analysts and threat hunters.
	11.13	Identify and explain the function, main tasks, and goal of the RED, BLUE, PURPLE, and WHITE teams in cyber security.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

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CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

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Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Advanced Network Infrastructure**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100115
Program Type	College Credit Certificate (CCC)
Program Length	36 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112)

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 36 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Describe routing concepts.
02.0 Demonstrate understanding of routing protocols.
03.0 Demonstrate router configuration skills.
04.0 Explain LAN design and concepts.
05.0 Demonstrate VLAN configuration skills.
06.0 Describe WAN protocols and technologies.
07.0 Demonstrate WAN configuration skills.
08.0 Demonstrate an understanding of network security.
09.0 Describe remote access options.
10.0 Describe and implement IP addressing services.
11.0 Demonstrate an understanding of network maintenance, support and troubleshooting.

Florida Department of Education
Student Performance Standards

Program Title: **Advanced Network Infrastructure**
CIP Number: **0511100115**
Program Length: **36 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Describe routing concepts. The student will be able to:
01.01	Differentiate between routing and routable protocols.
01.02	Identify the hardware and software components of routers.
01.03	Explain the purpose and nature of routing tables.
01.04	Describe administrative distance and routing metrics such as hop counts and cost.
01.05	Explain how a router determines a path and forwards or drops a packet.
01.06	Differentiate between static and dynamic routing.
01.07	Explain the differences between class-full and classless routing.
01.08	Describe the use and operation of VLSM and CIDR.
01.09	Describe how a network converges.
02.0	Demonstrate understanding of routing protocols. The student will be able to:
02.01	Describe the characteristics of distance vector routing protocols.
02.02	Describe the characteristics of link state routing protocols.
02.03	Describe the differences between distance vector and link state routing protocols and determine the best routing protocol to use in a given situation.
02.04	Describe the features and operation of current internal and external routing protocols.
03.0	Demonstrate router configuration skills. The student will be able to:
03.01	Configure and verify router interfaces.
03.02	Perform basic router configuration using the Command Line Interface (CLI) to inspect the operations of the router.
03.03	Design and implement a classless IP addressing scheme for a network.
03.04	Describe a router for RIP version 2 operation.
03.05	Use advanced configuration commands with routers.

	03.06	Configure a router for OSPF routing in a network.
	03.07	Fine-tune OSPF settings on a router, including the configuration of reference bandwidth, redistribution of static and default routes, and modification of OSPF intervals, in order to optimize network performance.
	03.08	Verify and troubleshoot router operations in an OSPF network.
	03.09	Configure and modify metric on a router to improve network performance.
	03.10	Configure summarization and default route settings on a router to optimize network performance.
	03.11	Verify and troubleshoot router operations in complex network environment.
04.0	Explain LAN design and concepts. The student will be able to:	
	04.01	Identify the layers and functions of switched network architecture.
	04.02	Describe the principles and benefits of a hierarchical network design.
	04.03	Explain the technology and media access control method for Ethernet networks.
	04.04	Describe the issues associated with Layer 2.
	04.05	Describe the operation of a LAN switch.
	04.06	Describe the benefits of Virtual Local Area Networks (VLAN).
	04.07	Identify and describe the different VLAN encapsulation protocols and their operation.
	04.08	Describe the purpose and operation of VLAN Trunking Protocol (VTP) in the management of a switched network domain.
	04.09	Describe the purpose and operation of Spanning Tree Protocol (STP), and its variants.
	04.10	Describe the use of Inter-VLAN routing to connect different Networks in a switch-based network topology.
	04.11	Analyze business requirements and design a LAN structure to meet those requirements.
	04.12	Discuss quality-of-service considerations and switching prioritization.
05.0	Demonstrate VLAN configuration skills. The student will be able to:	
	05.01	Perform and verify initial LAN switch configuration tasks including remote access management, switch port modes, and trunks.
	05.02	Configure, verify, and troubleshoot VLANs on a LAN switch.
	05.03	Implement a VLAN Domain by configuring LAN switches for VTP network operation.
	05.04	Configure a router to provide Inter-VLAN routing using multiple physical interfaces, and on a single physical interface with sub-interfaces.
	05.05	Configure and troubleshoot STP and its variants on a switched network environment.
	05.06	Configure and verify the bridge to optimize STP.
	05.07	Establish and configure port priorities.

	05.08 Troubleshoot and resolve issues with STP operations.
	05.09 Manage router and switch OS software.
06.0	Describe (WAN). The student will be able to:
	06.01 Describe WAN and MAN topologies.
	06.02 Differentiate between WAN and LAN topologies.
	06.03 Identify and describe WAN protocols.
	06.04 Describe the impact of applications (Voice Over IP, Video Over IP) on a network.
	06.05 Identify major network issues associated with the Internet, intranets and extranets.
	06.06 Explain the differences between the use of leased lines, packet-switched, and circuit-switched technologies.
	06.07 Describe typical WAN links and discuss bandwidth considerations.
	06.08 Identify and manage licensing.
07.0	Demonstrate WAN protocols and technologies. The student will be able to:
	07.01 Configure and verify Point-to-Point WAN connection.
	07.02 Configure and verify a packet switched WAN connection.
	07.03 Configure and verify a basic WAN serial connection and PPP connection between routers.
	07.04 Configure and verify a PPP connection between routers.
	07.05 Troubleshoot WAN implementation issue.
	07.06 Implement LAN/WAN connections, including virtual private networks (VPN), tunneling.
08.0	Demonstrate an understanding of network security. The student will be able to:
	08.01 Implement basic switch security measures such as port security, trunk access, and management VLANs.
	08.02 Identify current network security threats and explaining how to implement a comprehensive security policy to mitigate common threats to network devices, hosts, and applications.
	08.03 Describe the functions of common security appliances and applications.
	08.04 Implement recommended security practices to secure network devices.
	08.05 Discuss the functions of authentication servers.
	08.06 Describe the function and use of Access Control Lists (ACLs).
	08.07 Verify, monitor, and troubleshoot ACLs in a network environment.
09.0	Describe remote access options. The student will be able to:

	09.01	Compare and contrast remote access protocols, wireless standards and network authentication methods.
	09.02	Configure static and dynamic routing and Network Address Translation (NAT).
	09.03	Configure remote access services, protocols and policies, conditions and settings.
	09.04	Describe Remote Access Dial-In User Service (RADIUS).
	09.05	Monitor and troubleshoot remote access.
10.0	Describe and implement IP addressing services. The student will be able to:	
	10.01	Describe the purpose and operation of DHCP and DNS in a networked environment.
	10.02	Configure, verify, and troubleshoot DHCP and DNS operations on a router.
	10.03	Describe the operation and use of NAT and Port Address Translation (PAT) to provide Internet access to Private IP Address networks.
	10.04	Configure, verify, and troubleshoot NAT on a router, including static translation, use of IP Address pools, and sharing a public IP address on a router interface.
	10.05	Explain the abbreviating rules, purpose and operation of IPv6.
	10.06	Configure, verify, and troubleshoot IPv4 and IPv6 routing in a network.
11.0	Demonstrate an understanding of network maintenance, support and troubleshooting. The student will be able to:	
	11.01	Identify, interpret and maintain network documentation, procedures and practices.
	11.02	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
	11.03	Follow standard operating procedures for troubleshooting hardware and software.
	11.04	Manage, maintain and backup router and switch system and configuration files.
	11.05	Recognize and resolve hardware and software configuration problems.
	11.06	Identify and explain resolution of common network problems found on layers 1 through 7 of the Open Systems Interconnection (OSI) model.
	11.07	Determine type of programs and procedures required to: baseline network performance, identify intrusion and unacceptable system use, identify performance issues, predict system failures, and optimize network availability.
	11.08	Inspect and evaluate malicious and suspicious activities via logs, Intrusion Detection Systems, software and appliances.
	11.09	Describe various attack vectors to a network and the threat mitigation techniques that protect those vectors.
	11.10	Explain how SIEM, SOAR, and AI is used in today’s networks for automation and threat detection.
	11.11	Explain the basics of the MITRE Att&CK framework, the Diamond Model, and the Cyber Kill Chain and how these intrusion analysis models are used.
	11.12	Describe how Security Onion is used to train security analysts and threat hunters.

11.13 Identify and explain the function, main tasks, and goal of the RED, BLUE, PURPLE, and WHITE teams in cyber security.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Virtualization**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100116
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Install and configure the virtualization platform.
02.0 Define core virtualization concepts, including cloud and hybrid models.

Florida Department of Education
Student Performance Standards

Program Title: **Network Virtualization**
CIP Number: **0511100116**
Program Length: **18 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (15111001112). At the completion of this program, the student will be able to:	
01.0	Install and configure the virtualization server platform. The student will be able to:
01.01	Install and configure the virtualization platform.
01.02	Install and configure the virtualization environment to create a new farm or join an existing farm.
01.03	Automate virtual machine and cluster deployment.
01.04	Monitor and maintain license usage requirements and trends.
01.05	Manage virtualization networking and storage.
01.06	Manage user sessions from the administrative console.
01.07	Configure network connectivity and storage for the virtualization software.
02.0	Define core virtualization concepts, including cloud and hybrid models. The student will be able to:
02.01	Identify requirements for virtual machines according to task.
02.02	Configure the virtual environment and the virtual machine properties.
02.03	Install, configure and manage a virtual machine desktop client.
02.04	Install, configure and manage a virtualized server.
02.05	Manually deploy and migrate virtual machines.
02.06	Configure and assign users to pooled virtual desktops and dedicated virtual desktops.
02.07	Convert physical machines to virtual machines.
02.08	Configure desktop resources for access by users.
02.09	Configure and monitor back up virtual machine data to shared storage.
02.10	Migrate, convert, and monitor virtual machines.
02.11	Create and update shared disks.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Advanced Network Virtualization**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100117
Program Type	College Credit Certificate (CCC)
Program Length	34 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 34 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency in basic computer maintenance and support.
02.0 Describe common operating systems deployments and associated practices.
03.0 Install and configure the virtualization platform.
04.0 Define core virtualization concepts, including cloud and hybrid models.
05.0 Evaluate and explain performance metrics and optimization in virtual environments.

Florida Department of Education
Student Performance Standards

Program Title: **Advanced Network Virtualization**
CIP Number: **0511100117**
Program Length: **34 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in basic computer maintenance and support. The student will be able to:
01.01	Describe the main computer components and their functions.
01.02	Describe the operation of computer systems, including input and output systems, file systems, device management, program loading, execution and data storage.
01.03	Explain and demonstrate the safe and ethical use of computers.
01.04	Describe and identify proficiency in connecting to and safely using the Internet.
01.05	Describe emerging computer technologies and discuss their potential impact.
01.06	Implement proper procedures for handling and safeguarding equipment.
01.07	Describe procedures for proper disposal of computer components.
01.08	Install, configure, maintain and secure computer systems and peripherals following institutional protocol.
01.09	Explain the procedures for updating firmware and ROM-BIOS on PCs and Laptops.
01.10	Implement work order procedures.
01.11	Design and implement systems redundancy and data backups.
01.12	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
01.13	List the steps in problem solving.
01.14	Recognize and resolve basic computer configuration problems.
02.0	Describe common operating systems deployments and associated practices. The student will be able to:
02.01	Compare and describe the components and functions of major operating systems.
02.02	Explain the functions, features, and differences of Active Directory and Directory Services.
02.03	Install, configure and update client and server operating systems.
02.04	Describe the purpose and uses of computer virtualization.
02.05	Manage device drivers and software for peripheral devices.

	02.06 Manage the network and firewall settings of a client.
	02.07 Use an operating system for activities such as data and file management.
	02.08 Identify current systems utilities and describe their functions.
	02.09 Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.
	02.10 Create, use, maintain, backup and restore system configuration files.
	02.11 Restate the correct procedure/s for uninstalling operating system software.
	02.12 Install and configure client software for connecting to LANs, WANs, and the Internet.
	02.13 Demonstrate knowledge of basic troubleshooting methodology.
03.0	Install and configure the virtualization platform. The student will be able to:
	03.01 Install and configure the virtualization platform.
	03.02 Install and configure the virtualization environment to create a new farm or join an existing farm.
	03.03 Automate virtual machine and cluster deployment.
	03.04 Monitor and maintain license usage requirements and trends.
	03.05 Manage virtualization networking and storage.
	03.06 Manage user sessions from the administrative console.
	03.07 Configure network connectivity and storage for the virtualization software.
04.0	Define core virtualization concepts, including cloud and hybrid models. The student will be able to:
	04.01 Identify requirements for virtual machines according to task.
	04.02 Configure the virtual environment and the virtual machine properties.
	04.03 Install, configure and manage a virtual machine desktop client.
	04.04 Install, configure and manage a virtualized server.
	04.05 Manually deploy and migrate virtual machines.
	04.06 Configure and assign users to pooled virtual desktops and dedicated virtual desktops.
	04.07 Convert physical machines to virtual machines.
	04.08 Configure desktop resources for access by users.
	04.09 Configure and monitor back up virtual machine data to shared storage.
	04.10 Migrate, convert, and monitor virtual machines.

	04.11 Create and update shared disks.
05.0	Evaluate and explain performance metrics and optimization in virtual environments. The student will be able to:
	05.01 Manage user access to virtualized applications and machines in the virtualization infrastructure.
	05.02 Manage the infrastructure to provide high availability and data access.
	05.03 Describe administration of the virtualization environment.
	05.04 Describe tools that can be used to monitor virtualization application servers and sessions.
	05.05 Manage and maintain network infrastructure and storage resources.
	05.06 Create and apply worker groups.
	05.07 Configure and optimiza load management.
	05.08 Configure a resource pool for optimal performance.
	05.09 Troubleshoot infrastructure problems and virtual envitonment issues.
	05.10 Resolve application compatibility issues.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Security**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100118
Program Type	College Credit Certificate (CCC)
Program Length	30 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 30 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify key principles of network security and data protection.
02.0 Conduct a Red, Purple, or Blue team activity and compile a list of recommendations.
03.0 Explain cybersecurity threats and mitigation strategies.
04.0 Demonstrate proficiency in the basic foundations of advanced security concepts.
05.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Network Security**
CIP Number: **0511100118**
Program Length: **30 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Identify key principles of network security and data protection. The student will be able to:
01.01	Explain the major categories of computer crimes and attacks.
01.02	Identify vulnerabilities inherent in network devices, protocols and services.
01.03	Develop institutional security policies and practices in compliance with relevant governmental standards and regulations.
01.04	Implement protective measures in securing critical information assets.
01.05	Deploy various network security related equipment including, firewalls, intrusion prevention systems, and proxies.
01.06	Secure critical network services such as Directory Services, Domain Name Service (DNS), Dynamic Host Configuration Protocol (DHCP), and File Transfer Protocol (FTP).
01.07	Secure desktop client operating systems against viruses, malware and other malicious attacks.
01.08	Detect malicious and abnormal activities through logs, intrusion detection systems and other utilities and appliances.
02.0	Conduct a Red, Purple, or Blue team activity and compile a list of recommendations. The student will be able to:
02.01	Identify organizational compliance with regulatory and legislative Information Assurance (IA) requirements.
02.02	Identify physical and logical weaknesses in computers and networks as well as physical weaknesses and weaknesses in policies, procedures and practices relating to the network and the organization.
02.03	Test the network perimeter defense mechanisms to ensure boundaries.
02.04	Simulate methods that intruders use to gain unauthorized access to an organization’s networked systems and attempted to compromise them.
02.05	Deploy proprietary and/or open source tools to test known technical vulnerabilities in networked systems.
02.06	Determine which vulnerabilities are exploitable and the degree of information exposure or network control that the organization could expect an attacker to achieve after successfully exploiting vulnerability.
02.07	Recommend procedures to mitigate against discovered vulnerabilities and security gaps.
02.08	Prepare penetration testing deliverables including reports, documentations.
02.09	List four ethical requirements of Red, Pucple, and Blue team members.
03.0	Explain cybersecurity threats and mitigation strategies. The student will be able to:

	03.01 Explain contingency planning and its components.
	03.02 Collect data from logs and other resources to aid in detecting security incidents.
	03.03 Assemble an incidence response plan.
	03.04 Recover from incidents by restoring services and processes.
	03.05 Manage evidentiary data in an electronic environment.
04.0	Demonstrate proficiency in the basic foundations of advanced security concepts. The student will be able to:
	04.01 Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	04.02 Describe the forensic and evidentiary considerations when determining containment.
	04.03 Describe the types and sources of data collected for forensic analysis.
	04.04 Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
	04.05 Explain the processes by which data is collected for analysis.
	04.06 Describe the role of system event logs in data collection.
	04.07 Describe the role of the process log in data collection.
	04.08 Describe the processes associated with preserving evidence collected for forensic purposes.
	04.09 Describe how the chain of custody can be maintained for evidence collected during a forensic analysis effort.
05.0	Demonstrate employability skills. The student will be able to:
	05.01 Conduct effective job search.
	05.02 Secure information about portential job opportunities.
	05.03 Identify and prepare commonly required documents for job applications.
	05.04 Accurately complete a job application form.
	05.05 Demonstrate effective job interview skills.
	05.06 Apply appropriate decision-making strategies appropriate to workplace and career contexts.
	05.07 Exhibit appropriate work/behavioral habits.
	05.08 Demonstrate acceptable employee personal hygiene and healt standards consistent with workplace expectations.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Digital Forensics**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100119
Program Type	College Credit Certificate (CCC)
Program Length	32 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 32 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency in the basic foundations of advanced security concepts.
02.0 Exhibit proficiency in managing hardware involved in imaging and data collection activities.
03.0 Illustrate competence in analyzing common file systems.
04.0 Apply knowledge in performing computer forensics investigations.
05.0 Apply knowledge in performing mobile device forensics.
06.0 Create and implement incident handling and response processes.
07.0 Identify key pieces of legislation and processes related to digital forensics.
08.0 Define the tasks related to the casework process.

Florida Department of Education
Student Performance Standards

Program Title: **Digital Forensics**
CIP Number: **0511100119**
Program Length: **32 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the basic foundations of advanced security concepts. The student will be able to:
01.01	Demonstrate knowledge of cybersecurity foundations, including its origins, trends, culture, and legal implications.
01.02	Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, organizational).
01.03	Describe the role of digital certificates and their role in IT security.
01.04	Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
01.05	Describe the use of firewalls and other means of intrusion prevention.
01.06	Describe security design principles and their role in limiting points of vulnerability.
01.07	Discuss authentication methods and strategies.
01.08	Describe the processes involved in hardening a computer system or network.
01.09	Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.
01.10	Evaluate an existing security posture and identify gaps and vulnerabilities in security.
01.11	Describe the types of penetration tests (i.e., human, physical, wireless, data networks, telecommunications), the goals of each type, the metrics tested, and the value of their results.
01.12	Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
01.13	Describe common testing methodologies and standards used in penetration testing.
01.14	Demonstrate proficiency in basic forensic concepts.
01.15	Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
01.16	Create a risk management framework.
01.17	Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
01.18	Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, and Appendices).

	01.19 Describe the purpose and scope of an IT security disaster recovery plan.
	01.20 Describe the purpose and scope of an IT security business continuity plan.
	01.21 Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	01.22 Describe the forensic and evidentiary considerations when determining containment.
	01.23 Describe the types and sources of data collected for forensic analysis.
	01.24 Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
02.0	Exhibit proficiency in managing hardware involved in imaging and data collection activities. The student will be able to:
	02.01 Discuss the different types of Motherboard Connections.
	02.02 Explain the components that comprise a Motherboard and their functions.
	02.03 Describe the different types of permanent storage.
	02.04 Compare and contrast the different host interface standards.
	02.05 Describe how Solid State Storage processes differ from traditional storage.
	02.06 Discuss the different types of removable media and their impacts on data collection.
	02.07 Explain the concepts of RAID including the different Levels and their impacts on the imaging and collection process.
	02.08 Compare and contrast the read/write process of both permanent and temporary storage devices.
	02.09 Compare the standard boot process to the Forensic/controlled boot process.
03.0	Illustrate competence in analyzing common file systems. The student will be able to:
	03.01 Define the Master Boot Record (MBR) and discuss its purpose and any important items that it may contain.
	03.02 Explain the purpose of the Boot Parameter Block (BPB) and its components.
	03.03 Discuss the different File Systems available in an OS environment. Identify the strengths and weaknesses of each system.
	03.04 Explain the process of file creation and deletion in an OS environment including the concept of file artifacts.
	03.05 Discuss the formatting process in an OS environment.
	03.06 Explain pertinent OS system files related to data storage and their functions.
	03.07 Discuss how Windows handles the concept of Date and Time in relation to file management and how it differs from UNIX-like operating systems.
	03.08 Define the different file systems that can be used with removable media.
	03.09 Explain the concepts of Open and Closed sessions.
04.0	Apply knowledge in performing computer forensics investigations. The student will be able to:

	04.01	Create security incident handling and response policies.
	04.02	Recover deleted, encrypted, or damaged file information as evidence for civil or criminal cases.
	04.03	Deploy proprietary and/or open source tools to identify an intruder's footprints.
	04.04	Coordinate incident response activities in cooperation with law enforcement agencies.
	04.05	Prepare proper documentations of chain of custody, accounting for where each evidence item originated from, where it is going, and what entity has possession of the evidence.
	04.06	Preserve forensic integrity of evidence so they can be admissible in court.
	04.07	Describe moral and ethical standards in conducting digital forensics investigations.
05.0	Apply knowledge in performing mobile device forensics. The student will be able to:	
	05.01	Preserve, acquire, and examine data stored on mobile devices.
	05.02	Perform forensic acquisition and examination of SIM cards.
	05.03	Apply forensic principles and tools to mobile and IoT devices.
	05.04	Demonstrate proficiency in using open-source and proprietary mobile device forensics tools.
	05.05	Compare forensic acquisition tools and validate the completeness and accuracy of results.
	05.06	Describe forensic acquisition and examination of GPS navigation devices.
	05.07	Utilize the results from mobile device forensics for internal investigations or in civic/criminal litigation.
06.0	Create and implement incident handling and response processes. The student will be able to:	
	06.01	Design an incident response plan including: assessment, communication, containment, evaluation, recovery, and documentation.
	06.02	Describe information-hiding techniques.
	06.03	Describe the steps required to collect, seize, and protect evidence.
	06.04	Recover data from various storage devices after physical and/or logical damage.
	06.05	Search and report on memory in real time with live and system forensics.
	06.06	Investigate network traffic using log files, time analysis, sniffers, and other traffic analysis tools.
	06.07	Explain the legal considerations to investigating emails as prescribed in the Electronic Communications Privacy Act.
	06.08	Identify email tracing techniques in forensic investigations.
07.0	Identify key pieces of legislation and processes related to digital forensics. The student will be able to:	
	07.01	Describe the importance of creating an accurate representation of the facts.
	07.02	Explain the components of the Discovery Process.

	07.03	Discuss the 4th Amendment and its impact on the digital forensics investigative process.
	07.04	Identify laws and court cases related to computer forensics and their impacts on the investigation process.
	07.05	Identify and explain the basic Federal Rules of Evidence.
	07.06	Compare and contrast the different qualifications required to be a licensed computer forensics professional from state to state.
	07.07	Define the concept of a subpoena and explain the process of how one is obtained.
	07.08	Explain the steps required to acquire a search warrant.
	07.09	Discuss the concept of consent and the ways that it can be granted.
	07.10	Compare the legal process for civil and criminal cases.
	07.11	Define the concept of expert testimony and the process involved in being classified as an expert.
	07.12	Discuss appropriate courtroom behavior.
08.0	Define the tasks related to the casework process. The student will be able to:	
	08.01	Explain the steps involved in maintaining the integrity of digital evidence.
	08.02	Discuss the process of creating a forensics image.
	08.03	Define hashing and explain its uses in ensuring image authenticity.
	08.04	Describe sector slack space and its potential impact on evidence gathering.
	08.05	Describe the importance of documenting the examination process.
	08.06	Explain control/security access logs for images and their importance in maintaining evidence.
	08.07	Describe the steps involved in preparing evidence and documents for trial.
	08.08	Explain the procedures involved in creating a digital forensics investigation report including examples of report formats.
	08.09	Discuss the importance of the Summation and Analysis sections of the digital investigation report.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

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CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

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Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **IP Communications**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100120
Program Type	College Credit Certificate (CCC)
Program Length	32 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 32 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate the understanding of IP Communications.
02.0 Explain digitizing voice traffic and voice compression standards.
03.0 Identify and explain Quality of Service (QoS) requirements in a converged data and voice network.
04.0 Explain the types of IP communication-design options.
05.0 Demonstrate proficiency in troubleshooting IP communications.
06.0 Explain deployment of advanced Voice over IP (VoIP) and Data Bundle solutions to provide a single network connection for phone services and high-speed Internet.
07.0 Illustrate knowledge of using Statistical Analysis System *(*SAS) sessions to exchange data by using the TCP/IP communications access method.
08.0 Identify key concepts for Video over IP.

Florida Department of Education
Student Performance Standards

Program Title: **IP Communications**
CIP Number: **0511100120**
Program Length: **32 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate the understanding of IP Communications. The student will be able to:
01.01	Describe the supported multivendor hardware platforms for VoIP technology, their limits, and their boundaries.
01.02	Describe how Voice Gateways function in an IP Telephony (IPT) solution.
01.03	Identify and describe the Local Area Network (LAN) switching products useable in an IPT solution.
02.0	Explain digitizing voice traffic and voice compression standards. The student will be able to:
02.01	Identify the steps required for analog to digital conversion in a VoIP network.
02.02	Identify the signaling steps required to complete a Public Switched Telephone Network (PSTN) call.
02.03	Define the function of Private Branch eXchanges (PBX) or key systems.
02.04	Configure Foreign eXchange Subscriber (FXS) and Foreign eXchange Office (FXO) interfaces on a Voice Gateway.
03.0	Identify and explain Quality of Service (QoS) requirements in a converged data and voice network. The student will be able to:
03.01	Identify the steps required to minimize jitter, packet loss and serialization delay in a VoIP network.
03.02	Explain the function of IP precedence and different Class of Service (CoS) types.
03.03	Identify and list the types of traffic coming into the interface and defining their relative priority.
03.04	Configure a priority or custom queuing list.
04.0	Explain the types of IP communication-design options. The student will be able to:
04.01	Identify the most appropriate gateway in IP communication design.
04.02	Identify and describe dial plan architecture in IP communication design.
04.03	Identify the correct route patterns, filters, and use of wild cards in VoIP design scenarios.
04.04	List available classes of services in IP communication design and their constraints.
04.05	Describe how to use digit manipulation in VoIP design.
04.06	Identify the appropriate QoS tools needed for the proper operation of voice traffic on a network.

05.0	Demonstrate proficiency in troubleshooting IP communications. The student will be able to:
05.01	Identify the appropriate method for providing redundancy in VoIP design.
05.02	Describe the tools used in troubleshooting IP communication networks.
05.03	Identify and describe the different call flows and series of events through the call traces and debug outputs when troubleshooting.
05.04	List the alarms used in IP communication troubleshooting.
06.0	Explain deployment of advanced Voice over IP (VoIP) and Data Bundle solutions to provide a single network connection for phone services and high-speed Internet. The student will be able to:
06.01	Identify the required bandwidth speeds needed for uninterrupted service and fast uploads and downloads.
06.02	Describe the impact of voice samples, codecs, and packet size on bandwidth.
06.03	Describe on demand use of voice/data and voice prioritization, delivered over a private/secure line.
06.04	Describe features for a VoIP and data bundle.
06.05	Describe VoIP and data bundle used to dynamically alternate between voice and Internet as call volume needs dictate.
07.0	Illustrate knowledge of using Statistical Analysis System *(*SAS) sessions to exchange data by using the TCP/IP communications access method. The student will be able to:
07.01	Identify that a SAS/SHARE server ID has been added to the TCP/IP SERVICES file.
07.02	Describe how to invoke SAS sessions utilizing TCP/IP communications access method.
07.03	Describe syntax used to identify port numbers, defined in the client TCP/IP SERVICES file.
08.0	Identify key concepts for Video over IP. The student will be able to:
08.01	Describe video over IP systems using existing standards to reduce the data to a bitstream and then an IP network to carry the encapsulated data in a stream of IP packets.
08.02	Describe the quality of service requirements which must be fulfilled for use in broadcast carrying video over IP networks.
08.03	Describe bandwidth requirements, the maximum allowable packet loss rate, and approaches to achieve acceptable bandwidth such as quantity of service, network admission control, bandwidth reservation, traffic shaping, and traffic prioritization techniques.
08.04	Describe latency variation and its effect on making synchronization more complex by making the recovery of the underlying timing of the video signal far more difficult.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Support Technician**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100121
Program Type	College Credit Certificate (CCC)
Program Length	21 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting 21 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
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03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency in basic computer network maintenance and support.
02.0 Explain and apply fundamental concepts of computer networking.
03.0 Describe common operating systems deployments and associated practices.
04.0 Demonstrate fundamental proficiency in network security essentials.

Florida Department of Education
Student Performance Standards

Program Title: **Network Support Technician**
CIP Number: **0511100121**
Program Length: **21 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in basic computer network maintenance and support. The student will be able to:
01.01	Describe the main computer components and their functions.
01.02	Describe the operation of computer systems, including input and output systems, file systems, device management, program loading, execution and data storage.
01.03	Explain and demonstrate the safe and ethical use of computers.
01.04	Describe and identify proficiency in connecting to and safely using the Internet.
01.05	Describe emerging computer technologies and discuss their potential impact.
01.06	Implement proper procedures for handling and safeguarding equipment.
01.07	Describe procedures for proper disposal of computer components.
01.08	Install, configure, maintain and secure computer systems and peripherals following institutional protocol.
01.09	Explain the procedures for updating firmware and ROM-BIOS on PCs and Laptops.
01.10	Implement work order procedures.
01.11	Design and implement systems redundancy and data backups.
01.12	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
01.13	List the steps in problem solving.
01.14	Recognize and resolve basic computer configuration problems.
01.15	Identify and summarize 5 major Hive Keys of the Windows Registry.
02.0	Explain and apply fundamental concepts of computer networking. The student will be able to:
02.01	Explain the use of binary numbers and perform related binary and hexadecimal arithmetic.
02.02	Describe current network environments.
02.03	Describe network communications and architecture.
02.04	Identify network components, media, connectors, applications and protocols.

02.05	Compare and contrast the OSI and TCP/IP reference models and explain their stop/down encapsulation process.
02.06	Identify and describe current relevant IEEE network standards.
02.07	Explain a class 'C' network using a classful and classless routing scheme.
02.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
02.09	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
02.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
02.11	Describe the major functions of LAN protocols.
02.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
02.13	Configure and explain the TCP/IP protocol stack.
02.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
02.15	Identify emerging technologies and discuss related technical issues.
02.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
02.17	State the functionality and purpose of Virtual Local Area Networks (VLANS).
02.18	Identify and explain wide area network (WAN) concepts.
02.19	Plan, configure and test a small network and establish baselines.
02.20	Describe the major functions of network server software components.
02.21	Install applications on a server and configure clients for network access.
03.0	Describe common operating systems deployments and associated practices. The student will be able to:
03.01	Compare and describe the components and functions of major operating systems.
03.02	Explain the functions, features and differences of Active Directory and Directory Services.
03.03	Install, configure and update client and server operating systems.
03.04	Describe the purpose and uses of computer virtualization.
03.05	Manage device drivers and software for peripheral devices.
03.06	Manage the network and firewall settings of a client.
03.07	Use an operating system for activities such as data and file management.
03.08	Identify current systems utilities and describe their functions.
03.09	Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.

	03.10 Create, use, maintain, backup and restore system configuration files.
	03.11 Restate the correct procedure/s for uninstalling operating system software.
	03.12 Install and configure client software for connecting to LANs, WANs, and the Internet.
	03.13 Demonstrate knowledge of basic troubleshooting methodology.
04.0	Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards. The student will be able to:
	04.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	04.02 Define and describe malicious software and techniques to protect systems from its effects.
	04.03 Explain the difference between an on-path attack vs an on-network attack and how to mitigate them both.
	04.04 Explain the use of the 5x5 risk matrix tool and where it is commonly used.
	04.05 Describe the principles and techniques of securing data storage and transmission.
	04.06 Explain the current encryption and authentication standards.
	04.07 Describe security policies, including compliance and operational security.
	04.08 Configure access control, identity management and security logging.
	04.09 Describe client and network system security software and related updates.
	04.10 Explain the differences between software and hardware firewalls and where they are used.
	04.11 Demonstrate the use of Command Line Interface (CLI) troubleshooting tools.
	04.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	04.13 Describe the purpose and operation of network protocol analyzers.
	04.14 Demonstrate the network use of Wireshark;Nmap, and evaluate Nmap results.
	04.15 Demonstrate critical thinking skills during network and security troubleshooting.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Linux System Administrator**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100122
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Network Systems Technology AS degree program (1511100112).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate ability to use essential tools.
02.0 Demonstrate ability to run operating systems.
03.0 Configure local storage.
04.0 Create and configure file systems.
05.0 Demonstrate skills to deploy, configure, and maintain systems.
06.0 Manage users and groups.
07.0 Manage security.

Florida Department of Education
Student Performance Standards

Program Title: **Linux System Administrator**
CIP Number: **0511100122**
Program Length: **24 credit hours**

This certificate program is part of the Network Systems Technology AS degree program (1511100112). At the completion of this program, the student will be able to:	
01.0	Demonstrate ability to use essential tools. The student will be able to:
01.01	Access a shell prompt and issue commands with correct syntax.
01.02	Demonstrate the use of standard-in, standard-out, standard-error, and pipe.
01.03	Demonstrate the use of grep and regular expressions to analyze text.
01.04	Access remote systems using SSH.
01.05	Log in and switch users in multiuser targets.
01.06	Archive, compress, unpack, and uncompress files using a variety of tools.
01.07	Create and edit text files.
01.08	Create, delete, copy, and move files and directories.
01.09	Implement hard and soft links appropriately.
01.10	List, set, and change standard ugo/rwx permissions.
01.11	Locate and interpret system documentation including man, info, and files in /usr/share/doc.
02.0	Demonstrate ability to run operating systems. The student will be able to:
02.01	Boot, reboot, and shut down a system normally.
02.02	Boot systems into different targets manually.
02.03	Interrupt the boot process in order to gain access to a system.
02.04	Identify CPU/memory intensive processes, adjust process priority with renice, and kill processes.
02.05	Locate and interpret system log files and journals.
02.06	Perform various logging related activities such as configuring logging, log rotation and log reporting.
02.07	Access a virtual machine's console.
02.08	Explain the meaning and use of common metrics such as utilization values for CPU, memory, disk space, disk I/O, and network bandwidth.

	02.09 Start and stop virtual machines.
	02.10 Start, stop, and check the status of network services.
	02.11 Securely transfer files between systems.
03.0	Configure local storage. The student will be able to:
	03.01 List, create, and delete partitions on MBR and GPT disks.
	03.02 Create and remove physical volumes, assign physical volumes to volume groups, and create and delete logical volumes.
	03.03 Configure systems to mount file systems at boot by Universally Unique ID (UUID) or label.
	03.04 Create, use and remove snapshots of logical volumes.
	03.05 Add new partitions and logical volumes, and swap to a system non-destructively.
04.0	Create and configure file systems. The student will be able to:
	04.01 Create, mount, unmount, and use various file systems.
	04.02 Mount and unmount CIFS and NFS network file systems.
	04.03 Extend existing logical volumes.
	04.04 Discuss the use of setuid and setgid.
	04.05 Create and manage Access Control Lists (ACLs).
	04.06 Troubleshoot file permission problems.
05.0	Demonstrate skills to deploy, configure, and maintain systems. The student will be able to:
	05.01 Configure networking and hostname resolution statically or dynamically.
	05.02 Schedule tasks using at and cron.
	05.03 Start and stop services and configure services to start automatically at boot.
	05.04 Configure systems to boot into a specific target automatically.
	05.05 Perform an unattended system install.
	05.06 Configure a physical machine to host virtual guests.
	05.07 Install Linux systems as virtual guests.
	05.08 Configure systems to launch virtual machines at boot.
	05.09 Configure network services to start automatically at boot.
	05.10 Configure a system to use time services.

	05.11 Install and update software packages from a remote repository or a local file system.
	05.12 Update the kernel package appropriately to ensure a bootable system.
	05.13 Modify the system bootloader.
06.0	Manage users and groups. The student will be able to:
	06.01 Create, delete, and modify local and global user accounts.
	06.02 Change passwords and adjust password aging for local and global user accounts.
	06.03 Create, delete, and modify local and global groups and group memberships.
	06.04 Configure a system to use an existing authentication service for user and group information.
07.0	Manage security. The student will be able to:
	07.01 Describe basic concepts and mechanisms, including encryption, password safety, message digests and system security requirements.
	07.02 Apply proper security techniques and monitoring.
	07.03 Configure firewall settings using firewall-config, firewall-cmd, or iptables.
	07.04 Configure key-based authentication for SSH.
	07.05 Set enforcing and permissive modes for SELinux.
	07.06 List and identify SELinux file and process context.
	07.07 Restore default file contexts.
	07.08 Use boolean settings to modify system SELinux settings.
	07.09 Troubleshoot SELinux policy violations.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Database & E-Commerce Security**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100311
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the IT Security AS degree program (1511100307).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as Database Security Professionals and E-Commerce Security Professionals in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to work in Internet, intranet, extranet, and enterprise environments; installing, configuring, designing, and managing secure database and E-commerce resources.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 18 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of computer hardware.
02.0 Demonstrate an understanding of networked environments, hardware, and software.
03.0 Install and configure secure network systems software and utilities.
04.0 Demonstrate proficiency with Internet structure, organization, and navigation.
05.0 Demonstrate an understanding of network access control systems and methodology.
06.0 Describe cryptography concepts, standards, and applications.
07.0 Perform telecommunications and network security activities.
08.0 Demonstrate an understanding of Database Management Systems (DBMS).
09.0 Perform administrative tasks related to database security.
10.0 Demonstrate an understanding of E-commerce.
11.0 Perform tasks related to E-commerce security.
12.0 Perform webserver and site management activities.
13.0 Design and implement physical security measures.
14.0 Perform operation and security management practices.
15.0 Employ applications and systems development security techniques.
16.0 Develop business continuity and disaster recovery plans.
17.0 Describe ethical issues, pertinent laws, and how to conduct investigations.
18.0 Perform general organizational computing workplace competencies.
19.0 Perform project planning and management activities.
20.0 Perform documentation and technical reference activities.
21.0 Demonstrate employability skills.
22.0 Demonstrate professional development skills.

Florida Department of Education
Student Performance Standards

Program Title: **Database & E-Commerce Security**
CIP Number: **0511100311**
Program Length: **18 credit hours**

This certificate program is part of the IT Security AS degree program (1511100307). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of computer hardware. The student will be able to:
01.01	Describe multiple numbering systems used to represent instructions and data.
01.02	Identify the architecture of major hardware platforms.
01.03	Describe the functions of major hardware components of a computer system.
01.04	Discuss the potential impact of emerging hardware technologies.
01.05	Demonstrate the ability to perform preventive maintenance tasks on microcomputer systems.
01.06	Set up and configure computer systems and peripherals.
01.07	Configure the Basic Input/Output System (BIOS) of a computer system.
01.08	Install and configure storage devices, controllers, and network interfaces.
02.0	Demonstrate an understanding of networked environments, hardware, and software. The student will be able to:
02.01	Discuss fundamental network concepts such as topology, protocols, architecture, and internetworking.
02.02	Define all layers in the Open Systems Interconnect (OSI) and Transmission Control Protocol/Internetworking Protocol (TCP/IP) network protocol models.
02.03	Discuss the nature of Internetworking Protocol (IP) addresses and Media Access Control (MAC) addresses, and mapping between protocol addressing schemes.
02.04	Describe the functions and hardware requirements for current popular network servers and services.
02.05	Describe the major functions and hardware requirements of network client hardware components.
02.06	Describe current link technologies such as twisted-pair, coaxial, fiber optic, and wireless.
02.07	Describe the major functions of network connectivity hardware.
02.08	Describe the function of network storage devices, storage area networks (SAN), and other peripherals.
03.0	Install and configure secure network systems software and utilities. The student will be able to:
03.01	Install and configure current leading system software, drivers, and service packs.

03.02	Install, configure and set up a proxy server and a gateway.
03.03	Discuss the functions of authentication protocols and Virtual Private Networks (VPNs).
03.04	Install and configure web servers and related services.
03.05	Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.
03.06	Install and configure a secure desktop client operating system (OS).
03.07	Describe modifications necessary to an OS such as modifying parameters and how to handle conflicting interrupts when installing, configuring, and upgrading application software.
03.08	Install and configure client software for network-based applications.
03.09	Install and configure current popular network services for servers.
04.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
04.01	Describe Internet structure and administration.
04.02	Describe common Internet services and port numbers.
04.03	Demonstrate the use of internetworking protocols.
04.04	Differentiate between push and pull technologies.
04.05	Demonstrate the use of typical remote access mechanisms.
04.06	Describe the data format and proprietary nature of commonly used Internet file types.
04.07	Demonstrate use of Internet clients and services.
05.0	Demonstrate an understanding of network access control systems and methodology. The student will be able to:
05.01	Describe access control mechanisms and their impact on users, resources, and operations.
05.02	Compare and contrast access control techniques.
05.03	Administer computer, group, and user accounts.
05.04	Manage policies, rights, permissions, and passwords for users and/or groups of users.
05.05	Demonstrate an understanding of various access control models.
05.06	Manage password, PIN selection, maintenance, and control.
05.07	Demonstrate an understanding of methods of identification and authentication.
05.08	Implement centralized/remote authentication access controls.
05.09	Implement and manage decentralized access controls such as domain and trust relationships.
05.10	Analyze and explain methods of server attacks.

	05.11 Demonstrate an understanding of the different types of network intrusions and the different methods of detection.
	05.12 Monitor the network using various forms of intrusion detection resources to detect attacks.
	05.13 Investigate audit logs for signs of network intrusions.
	05.14 Find and report weaknesses in the access control system using penetration testing.
06.0	Describe cryptography concepts, standards, and applications. The student will be able to:
	06.01 Demonstrate an understanding of the encryption/decryption process.
	06.02 Demonstrate an understanding of the basic functions involved in key management.
	06.03 Describe methods to achieve confidentiality, integrity, and availability through authentication in a network environment.
	06.04 Identify the strengths and weaknesses of cryptographic algorithms and the effects of key length.
	06.05 Employ cryptographic algorithms.
	06.06 Implement current popular key distribution methods.
	06.07 Utilize application and network-based protocols.
	06.08 Describe the use of security hardware components.
07.0	Perform telecommunications and network security activities. The student will be able to:
	07.01 Utilize protocol layering models.
	07.02 Evaluate the security implications associated with the various physical media types.
	07.03 Describe security concerns with using various network topologies.
	07.04 Configure authentication protocol service(s) that provide dial-in authentication and security.
	07.05 Employ network monitors and packet sniffers to identify security threats.
	07.06 Implement security measures using network hardware and software.
	07.07 Discuss the security vulnerabilities of the TCP/IP protocol stack.
	07.08 Configure Network Layer security protocols.
	07.09 Configure Transport Layer security protocols.
	07.10 Configure Application Layer security protocols.
	07.11 Perform connection verification using current authentication protocols.
	07.12 Demonstrate an understanding of how wide area network serial line protocols work.
	07.13 Implement secure data communication techniques.

	07.14 Develop secure email, facsimile, and voice communication procedures to protect against network attacks.
	07.15 Employ alarms and signals to alert network security administrators of intrusions.
08.0	Demonstrate an understanding of Database Management Systems (DBMS). The student will be able to:
	08.01 Compare the major types of databases.
	08.02 Describe relational database concepts.
	08.03 Analyze the various components of a DBMS.
	08.04 Install and configure database server software.
	08.05 Perform database administration tasks using the Structured Query Language (SQL).
	08.06 Demonstrate an understanding of transaction processing and concurrency control.
	08.07 Perform database backup and recovery operations.
09.0	Perform administrative tasks related to database security. The student will be able to:
	09.01 Develop database security guidelines.
	09.02 Monitor database security systems.
	09.03 Manage web database security.
	09.04 Verify security compliance.
	09.05 Secure backup processes.
	09.06 Verify backup processes.
	09.07 Describe techniques to ensure database integrity and security.
10.0	Demonstrate an understanding of E-commerce. The student will be able to:
	10.01 Describe E-commerce and its impact on business and society.
	10.02 Differentiate between the various E-commerce business models.
	10.03 Discuss the steps necessary to maintain transaction integrity.
	10.04 Identify components and procedures necessary to process credit card transactions.
	10.05 Describe applicability of and compliance with Payment Card Industry Data Security Standards (PCI-DSS).
11.0	Perform tasks related to E-commerce security. The student will be able to:
	11.01 Manage digital certificates.
	11.02 Maintain integrity in transaction storage and reporting systems.

	11.03 Protect Personal Identifiable Information (PII) in transaction processes.
	11.04 Describe inventory control measures.
	11.05 Maintain security related to electronic communication.
	11.06 Describe methods used to review third-party transaction processing.
	11.07 Evaluate E-commerce platform vulnerabilities.
12.0	Perform web server and site management activities. The student will be able to:
	12.01 Describe the process of obtaining an Internet domain name and mapping it to an Internet Protocol (IP) address.
	12.02 Compare features of current website management tools.
	12.03 Configure current web server software.
	12.04 Use current web server software to maintain secure websites.
	12.05 Use web site access tracking and analysis tools to evaluate the security of a web server.
13.0	Design and implement physical security measures. The student will be able to:
	13.01 Identify physical threats and vulnerabilities to an enterprise's resources.
	13.02 Specify possible countermeasures to physically protect an enterprise's resources.
	13.03 Develop a list of physical facility requirements to secure the premises.
	13.04 Evaluate the feasibility of various technical controls to secure physical resources.
14.0	Perform operation and security management practices. The student will be able to:
	14.01 Perform personnel administrative security operations.
	14.02 Implement client and network system security software on an enterprise-wide basis.
	14.03 Perform and verify backups of critical information.
	14.04 Identify methods to protect the privacy of personal data.
	14.05 Demonstrate proper handling of sensitive information and media.
	14.06 Demonstrate an understanding of different control types.
	14.07 Determine what enterprise resources require protection.
	14.08 Compare the advantages and disadvantages of internal versus external audits.
	14.09 Perform compliance checks on user adherence to security policies.
	14.10 Identify different types of enterprise-wide monitoring tools and techniques.

14.11	Utilize enterprise-wide monitoring tools and techniques.
14.12	Implement countermeasures to defend against threats.
14.13	Perform penetration testing activities.
14.14	Describe principles of risk management and asset valuation.
14.15	Monitor enterprise-wide information for potential liabilities.
14.16	Manage software licenses and enforce compliance within the organization.
15.0	Employ applications and systems development security techniques. The student will be able to:
15.01	Describe the stages of the system development life cycle.
15.02	Describe security implications of structured programming techniques.
15.03	Analyze the controls that are included within systems and applications software and those used in the development of agents, applets, software, databases, data warehouses and knowledge-based systems.
15.04	Implement features to ensure data and application integrity, security and availability.
15.05	Analyze distributed environment application issues.
15.06	Analyze local environment application issues.
15.07	Analyze key database and data warehousing issues.
15.08	Develop multilevel security schemes for databases and data warehouses.
15.09	Compare different forms of data/information storage.
15.10	Describe different aspects of application and database security control architectures.
15.11	Compare and contrast elevated privileges and user modes of operation.
15.12	Identify various levels of application integrity.
15.13	Describe the impact that malicious code plays in software development.
15.14	Formulate countermeasures to defend against or detect malicious code.
15.15	Establish a secure development environment.
16.0	Develop business continuity and disaster recovery plans. The student will be able to:
16.01	Perform a business impact assessment.
16.02	Specify the necessary capabilities of alternative business sites.
16.03	Develop business continuity, disaster containment, and recovery plans.
16.04	Identify the impact of scheduled facility maintenance on enterprise systems.

	16.05 Develop a testing program for business continuity/disaster recovery plans.
	16.06 Develop a training program for personnel regarding business continuity/disaster recovery plans.
17.0	Describe ethical issues, pertinent laws, and how to conduct investigations. The student will be able to:
	17.01 Explain the major categories and types of laws as they relate to information security.
	17.02 Describe institutional policies and practices regarding data privacy and intellectual property rights.
	17.03 Describe abnormal and suspicious activity as it relates to information security.
	17.04 Identify potential data security threats.
	17.05 Describe legal institutional policies and practices to protect against purposeful violations of data integrity.
	17.06 Identify the major categories of computer crimes and attacks.
	17.07 Describe institutional policies and practices to conduct an investigation of security violations.
	17.08 Explain major ethical and legal issues related to Internet and system use.
18.0	Perform general organizational computing workplace competencies. The student will be able to:
	18.01 Deliver and follow oral and written technical instructions.
	18.02 Prepare and deliver a technical presentation.
	18.03 Participate in group discussions as a member and as a leader.
	18.04 Explain the importance of self-motivation and responsibility in completing assigned tasks.
	18.05 List the steps in problem solving.
	18.06 Identify and discuss issues contained within professional codes of conduct.
	18.07 Explain ethical aspects of intellectual property rights and licensing issues.
	18.08 Identify potential sources of employee/employer or employee/employer conflict and discuss possible approaches to resolve such disagreements.
	18.09 Identify appropriate workplace behavior.
	18.10 Identify principles and techniques for being a productive, contributing member of a team.
	18.11 Identify acceptable strategies for resolving conflict in the workplace.
	18.12 Describe principles and techniques for working productively with people of diverse cultures and backgrounds.
	18.13 Identify techniques for stress management and prevention of job burnout.
	18.14 Identify appropriate communication skills and etiquette.
19.0	Perform project planning and management activities. The student will be able to:

	19.01 List effective time management skills.
	19.02 Describe appropriate measures for planning and managing a large project.
	19.03 Create an implementation schedule for a large project.
	19.04 Describe appropriate measures for planning and implementing upgrades of hardware and software.
	19.05 Identify examples of effective end-user training strategies and techniques.
20.0	Perform documentation and technical reference activities. The student will be able to:
	20.01 Demonstrate technical writing skills.
	20.02 Identify information in printed and online technical references.
	20.03 Prepare documentation to track assets, security-related activities, and incidents.
21.0	Demonstrate employability skills. The student will be able to:
	21.01 Identify sources of employment opportunities.
	21.02 Identify employer expectations regarding attendance, punctuality, initiative and teamwork.
	21.03 Describe employee rights regarding privacy, discrimination, due process and safety.
	21.04 Identify the key requirements of a written job description.
	21.05 Identify methods for securing employment references.
	21.06 Compose a cover letter and a resume.
	21.07 Complete an employment application.
	21.08 Classify behaviors considered appropriate or inappropriate in a job interview situation.
	21.09 Demonstrate job interview skills.
	21.10 Compose a follow-up letter.
	21.11 Compose a letter of resignation.
22.0	Demonstrate professional development skills. The student will be able to:
	22.01 Identify corporate strategies and policies for professional development.
	22.02 Describe the importance of participating in professional organizations and maintaining professional contacts.
	22.03 Explain the importance of mentor relationships.
	22.04 Identify industry trends.
	22.05 Describe options for continuing education.

22.06	Identify industry journals, magazines and digital media.
22.07	Describe the importance of attending seminars, workshops, and tradeshows.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

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CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Cybersecurity Operations Analyst**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100313
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Cybersecurity Operations AS degree program (1511100300).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of network security, installing, configuring, monitoring, and detecting network violations in the LAN/WAN environment.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate a fundamental understanding of computer networking.
02.0 Demonstrate fundamental proficiency in network security essentials.
03.0 Demonstrate an understanding of network access control systems and methodology.
04.0 Demonstrate proficiency with Internet structure, organization, and navigation.
05.0 Demonstrate proficiency in analyzing network intrusions.
06.0 Demonstrate proficiency in incident handling and response.

Florida Department of Education
Student Performance Standards

Program Title: **Cybersecurity Operations Analyst**
CIP Number: **0511100313**
Program Length: **24 credit hours**

This certificate program is part of the Cybersecurity Operations AS degree program (1511100300). At the completion of this program, the student will be able to:	
01.0	Demonstrate a fundamental understanding of computer networking. The student will be able to
01.01	Describe current network environments.
01.02	Describe network communications and architecture.
01.03	Identify network components, media, connectors, applications and protocols.
01.04	Compare and contrast the OSI and TCP/IP reference models and their layers.
01.05	Identify and describe current relevant IEEE network standards.
01.06	Create an IP addressing scheme using Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
01.07	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
01.08	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
01.09	Identify standard network topologies and describe the advantages and disadvantages of each topology.
01.10	Describe current network environments.
01.11	Describe the major functions of LAN protocols.
01.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
01.13	Configure and manage the TCP/IP protocol stack.
01.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
01.15	Describe the major functions of LAN protocols.
01.16	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
01.17	Configure and manage the TCP/IP protocol stack.
01.18	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
01.19	Identify emerging technologies and discuss related technical issues.

	01.20 Design a local area network (LAN), including the specification of architecture, hardware and software.
	01.21 Identify the advantages and use of virtual local area networks (VLANs).
02.0	Demonstrate fundamental proficiency in network security essentials. The student will be able to:
	02.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	02.02 Define and describe malicious malware and techniques to protect systems from its effects.
	02.03 Describe Denial of Service attacks and means to defend against them.
	02.04 Identify the risks and techniques of data loss and its prevention.
	02.05 Describe the principles and techniques of securing data storage and transmission.
	02.06 Identify current encryption and authentication standards.
	02.07 Implement security policies, including compliance and operational security.
	02.08 Enable access control, identity management and security logging.
	02.09 Manage client and network system security software and related updates.
	02.10 Describe the functions and characteristics of firewalls.
	02.11 Perform a ping sweep to identify network hosts.
	02.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	02.13 Describe the purpose and operation of network protocol analyzers.
	02.14 Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
03.0	Demonstrate an understanding of network access control systems and methodology. The student will be able to:
	03.01 Specify by access control mechanisms what users can do, which resources they can access, and what operations they can perform on a system. Specify by access control mechanisms what users can do, which resources they can access, and what operations they can perform on a system.
	03.02 Compare and contrast access control techniques.
	03.03 Administer computer, group, and user accounts.
	03.04 Manage policies, rights, permissions, and passwords for users and/or groups of users.
	03.05 Demonstrate an understanding of various access control models.
	03.06 Manage password, PIN selection, maintenance, and control.
	03.07 Demonstrate an understanding of methods of identification and authentication.
	03.08 Implement centralized/remote authentication access controls.

	03.09 Implement and manage decentralized access controls such as domain and trust relationships.
	03.10 Analyze methods of server attacks.
	03.11 Demonstrate an understanding of the different types of intrusions and the different methods of intrusion detection.
	03.12 Monitor the network using various forms of intrusion detection resources to detect attacks.
	03.13 Investigate audit trails for signs of network intrusions.
	03.14 Perform penetration testing to find weaknesses in the access control systems.
04.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
	04.01 Describe the origin of the Internet.
	04.02 Outline the history of the Internet.
	04.03 Describe Internet organization, such as the InterNIC, domains and requests for comments (RFCs).
	04.04 Describe the structure of the Internet.
	04.05 Differentiate between the Internet and the WWW.
	04.06 Differentiate among an Intranet site, an extranet site, and an Internet site.
	04.07 Describe and identify several major ethical and legal issues related to Internet use and how they affect intellectual property rights.
	04.08 Describe the World Wide Web (WWW) and identify how it affects personal security and privacy and our society.
	04.09 Describe and differentiate between file types and protocols.
	04.10 Demonstrate the use of typical remote access mechanisms.
	04.11 Describe various sections of a URL.
05.0	Demonstrate proficiency in analyzing network intrusions. The student will be able to:
	05.01 Describe the role of a Cybersecurity Operations Analyst in the enterprise.
	05.02 Describe various software applications needed to support cybersecurity analyses.
	05.03 Describe the operation of the network infrastructure.
	05.04 Demonstrate how to analyze network intrusion data to identify compromised hosts and vulnerabilities.
	05.05 Identify various network security alerts.
	05.06 Correctly analyze intrusion data to determine potential exploits
	05.07 Describe the types of log files used in security monitoring.
	05.08 Demonstrate the use of various websites that generate malware analysis.

06.0	Demonstrate proficiency in incident handling and response. The student will be able to:
	06.01 Classify the various types of network attacks.
	06.02 Manage evidentiary data in an electronic environment.
	06.03 Describe the essential elements of forensic analysis.
	06.04 Describe incident response models used to manage network security incidents.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Cybersecurity Analyst**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100314
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Cybersecurity AS degree program (1511100308).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as, cybersecurity analyst, security engineer, cybersecurity technician, data communication analyst, intrusion and detection analyst, security architect, or secure software developer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to Cybersecurity Foundational Knowledge Units (KU), Technical and non-Technical Knowledge Units.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate a fundamental understanding of computer networking.
02.0 Demonstrate understanding of networked environments, hardware, and software.
03.0 Demonstrate fundamental proficiency in network security essentials.
04.0 Demonstrate an understanding of access control systems and methodology.
05.0 Perform secure web design/development activities.
06.0 Perform secure programming and scripting activities.

Florida Department of Education
Student Performance Standards

Program Title: **Cybersecurity Analyst**
CIP Number: **0511100314**
Program Length: **24 credit hours**

This certificate program is part of the Cybersecurity AS degree program (1511100308). At the completion of this program, the student will be able to:	
01.0	Demonstrate a fundamental understanding of computer networking. The student will be able to:
01.01	Explain the use of binary numbers and perform binary arithmetic.
01.02	Describe current network environments.
01.03	Describe network communications and architecture.
01.04	Identify network components, media, connectors, applications and protocols.
01.05	Compare and contrast the OSI and TCP/IP reference models and their layers.
01.06	Identify and describe current relevant IEEE network standards
01.07	Create an IP addressing scheme using Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
01.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
01.09	Identify and discuss issues related to naming conventions for user IDs, e-mail, passwords, and network hosts and devices.
01.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
01.11	Describe the major functions of LAN protocols.
01.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
01.13	Configure and manage the TCP/IP protocol stack.
01.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
01.15	Identify emerging technologies and discuss related technical issues.
01.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
01.17	Identify the advantages and use of virtual local area networks (VLANs).
01.18	Identify and explain wide area network (WAN) concepts.
01.19	Plan, configure and test a small network and establish baselines.
01.20	Describe the major functions of network server software components.

	01.21 Install applications on a server and configure clients for network access.
	01.22 Describe routing concepts.
02.0	Demonstrate understanding of networked environments, hardware, and software. The student will be able to:
	02.01 Give several advantages and disadvantages of networked and non-networked environments.
	02.02 Describe current network environments and network topologies.
	02.03 Identify and discuss issues such as security, privacy and redundancy related to networked environments.
	02.04 Identify and discuss standardization issues related to-naming conventions.
	02.05 Discuss the nature of IP and MAC addressing.
	02.06 Describe the major functions and requirements of web-based server and client hardware and software components.
	02.07 Identify various specialized servers.
	02.08 Recognize and describe current cable technologies.
	02.09 Describe current wireless technologies.
	02.10 Describe the major functions of network connectivity hardware, such as hubs, repeaters, bridges, routers, switches, and gateways.
	02.11 Describe the hardware needed to connect a LAN to the Internet.
	02.12 Describe the function of network storage devices and other peripherals.
	02.13 Compare and contrast major functions and features of current network operating systems and associated security controls.
	02.14 Differentiate between telecommunications and data communications.
	02.15 Compare and contrast digital communications lines and cable characteristics.
03.0	Demonstrate fundamental proficiency in network security essentials. The student will be able to:
	03.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	03.02 Define and describe malicious software and techniques to protect systems from its effects
	03.03 Describe Denial of Service (DoS) attacks and means to defend against them.
	03.04 Identify the risks and techniques of data loss and its prevention.
	03.05 Describe the principles and techniques of securing data storage and transmission.
	03.06 Identify current encryption and authentication standards.
	03.07 Implement security policies, including compliance and operational security.
	03.08 Enable access control, identity management and security logging.

	03.09	Manage client and network system security software and related updates.
	03.10	Describe the functions and characteristics of firewalls.
	03.11	Perform a ping sweep to identify network hosts.
	03.12	Perform a port scan to probe network hosts for open TCP and UDP ports.
	03.13	Describe the purpose and operation of network protocol analyzers.
	03.14	Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
	03.15	Describe the functions and characteristics of IDS (Intrusion Detection Systems) and IPS (Intrusion Prevention Systems).
04.0	Demonstrate an understanding of access control systems and methodology. The student will be able to:	
	04.01	Specify by access control mechanisms what users can do, which resources they can access, and what operations they can perform on a system.
	04.02	Compare and contrast access control techniques.
	04.03	Administer computer, group, and user accounts.
	04.04	Discuss policies, rights, permissions, and passwords for users and/or groups of users.
	04.05	Demonstrate an understanding of various access control models.
	04.06	Discuss password, PIN selection, maintenance, and control.
	04.07	Demonstrate an understanding of current and emerging methods of identification and authentication.
	04.08	Discuss centralized/remote authentication access controls.
	04.09	Analyze methods of server attacks.
	04.10	Demonstrate an understanding of the different types of intrusions and the different methods of intrusion detection.
	04.11	Monitor a network using various forms of intrusion detection resources to detect attacks.
	04.12	Investigate audit trails for signs of network Indicators of Compromise (IoC). (i.e., log files, alert reports, error reports, network performance reports, and output from tools to support analysis).
	04.13	Perform penetration testing to find weaknesses in the access control systems.
05.0	Perform secure web design/development activities. The student will be able to:	
	05.01	Demonstrate proficiency with Internet structure, organization, and navigation and describe the relation to the Internet and WWW.
	05.02	Describe and use the process of storyboarding a website.
	05.03	Describe format, structure and design principles for websites.
	05.04	Evaluate web graphic utilities and creation tools, including those for animated graphics.

	05.05	Identify existing resources and constraints.
	05.06	Evaluate design based on current industry and Open Web Application Security Project (OWASP) standards.
	05.07	Create site navigation plan including directory structure.
	05.08	Procure/create and incorporate standard and animated graphics into a webpage.
	05.09	Design page templates to implement on final site.
	05.10	Create a webpage using authoring tools.
	05.11	Code page(s) using current web programming languages.
	05.12	Check page for cross-browser capability and other access issues.
	05.13	Upload pages and run site analysis.
	05.14	Incorporate multimedia files into a webpage.
	05.15	Incorporate an e-mail link on a webpage.
	05.16	Incorporate internal and external links on a webpage.
	05.17	Incorporate tables and file transfer capabilities on a webpage.
	05.18	Incorporate handicapped-accessibility options into the website.
	05.19	Configure a webpage for Search Engine Optimization.
	05.20	Create a web form and produce e-mail results.
	05.21	Create a web database interface.
	05.22	Discuss the issue of ODBC compliance.
	05.23	Describe SQL Injections Concepts.
	05.24	Describe how JavaScript is used to manipulate the DOM (Document Object Model).
	05.25	Explain Cross-Site Scripting (XSS) and Cross-site request forgery (CSRF).
06.0	Perform secure programming and scripting activities. The student will be able to:	
	06.01	Identify several of the most prominent current programming languages.
	06.02	Characterize the stages of the system development life cycle.
	06.03	Differentiate between two common strategies for problem solving.
	06.04	Describe the program design and development process.
	06.05	Differentiate between structured programming and object-oriented programming.

06.06	Use programming, scripting, and/or macro languages to create and test programs.
06.07	Apply principles of good design and documentation when developing programs.
06.08	Write scripting code to handle error checking.
06.09	Write code to allow for interactions between the client and server.
06.10	Use scripting languages to create dynamic webpages.
06.11	Identify development tools.
06.12	Design, review, and test specifications and algorithms.
06.13	Write program according to specifications and revise based on testing and debugging.
06.14	Demonstrate proficient use of current scripting development languages.
06.15	Use scripting languages to automate administration tasks.
06.16	Describe regular expressions.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Project Management Associate**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100501
Program Type	College Credit
Program Length	12 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate is part of the Technology Project Management AS degree program (1511100509).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as project managers and professionals incorporating IT project management strategies in their business activities in the Information Technology career cluster; provides technical skill proficiency, and competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to balance of business and technology components and allows the student to gain additional skills in the area of Project Management.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 12 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Project costs and budgeting.
02.0 Fundamentals of project management.
03.0 Full project life cycle and various project management processes.
04.0 Define stakeholder expectations and initiate a project successfully.
05.0 Create a comprehensive project plan.
06.0 Work in teams, manage team members, and interact with stakeholders.
07.0 Plan and monitor project budget and schedule.
08.0 Basic tools and techniques of managing project quality and risk.
09.0 Principles of identifying, developing, and managing resources.
10.0 Navigating a project experiencing scope, resource, and scheduling constraints through effective communication.
11.0 Technical and human aspects of project control, with a focus on change control.
12.0 Contextual relationship between the project and the organization that hosts the project.
13.0 Ethical considerations in every aspect of a project's operations.

Florida Department of Education
Student Performance Standards

Program Title: **Project Management Associate**
CIP Number: **0511100501**
Program Length: **12 credit hours**

This certificate is part of the Technology Project Management AS degree program (1511100509). At the completion of this program, the student will be able to:	
01.0	Project costs and budgeting. The student will be able to:
01.01	Demonstrate an understanding of the basic accounting principles and practices.
01.02	Demonstrate an understanding of budgeting.
01.03	Demonstrate an understanding of costing.
01.04	Identify fundamental financial analysis concepts.
01.05	Describe financial analysis tools.
01.06	Understand and interpret financial reports.
02.0	Fundamentals of project management. The student will be able to:
02.01	Describe the importance of PM in the context of various organizational cultures and strategies, and summarize the typical components of the PM system and the processes that are considered essential to any project.
02.02	Select and describe an appropriate PM strategy for a new project that can meet stakeholder expectations in a given organizational context.
03.0	Full project life cycle and various project management processes. The student will be able to:
03.01	List and describe the project phases that make up a typical project, and summarize PM processes that occur within each.
03.02	Describe the typical PM process documentation and PM deliverables that are produced by project managers in each project phase.
04.0	Define stakeholder expectations and initiate a project successfully. The student will be able to:
04.01	Given an organizational context, project objectives, and recommended strategy, develop a sequence of categorized PM processes and activities that will meet stakeholder expectations.
04.02	Create, or identify, a project charter and its primary components, including writing a concise statement of business needs that the project will address.
05.0	Create a comprehensive project plan. The student will be able to:
05.01	Develop a PM plan that documents the actions necessary to define, coordinate, and measure all project activities, and to ensure control and management of costs and changes to the project.
05.02	Describe the components of the project plan and the interactions of the various processes of the project plan with other processes in the PM system.

06.0	Work in teams, manage team members, and interact with stakeholders. The student will be able to:
06.01	Select appropriate communication tools and methods to communicate with identified stakeholders, including commonly used templates for communication activities such as status reporting, issues tracking, change control, and project reviews.
06.02	Understand sources of conflict and, given a specific challenge, apply a problem-solving process that focuses on confronting and resolving the problem.
07.0	Plan and monitor project budget and schedule. The student will be able to:
07.01	Identify necessary labor and material resources, including contracted resources, and estimate how many units of each are required to meet project expectations.
07.02	Describe the fundamental types of time- and cost-estimating approaches and how these are best related to the time line of the project, becoming more specific as more information is known about project requirements, risks, and activities.
08.0	Basic tools and techniques of managing project quality and risk. The student will be able to:
08.01	Given a specific project context and plan, identify potential project risks and/or opportunities, evaluate each according to criteria for impact on the project, and document them in a prioritized risk register.
08.02	Demonstrate knowledge of the core quality processes and explain the role of each process in planning and managing projects.
09.0	Principles of identifying, developing, and managing resources. The student will be able to:
09.01	Demonstrate how teams are assigned and formed, and describe the stages of team development.
09.02	Enhance team capability after assessing personal strengths and weaknesses, and develop skills to manage a team and lead others.
10.0	Navigating a project experiencing scope, resource, and scheduling constraints through effective communication. The student will be able to:
10.01	Demonstrate ability to optimize the project schedule by allocating resources to the critical path.
10.02	Demonstrate ability to optimize schedules to maximize efficiency.
11.0	Technical and human aspects of project control, with a focus on change control. The student will be able to:
11.01	Demonstrate knowledge of how changes to project scope may affect the project's schedule, cost, and quality, and how to evaluate the impact and recommend a solution that produces the desired project product.
11.02	Describe how to monitor and control variances as they pertain to project cost, schedule, scope, and quality, and how to formally communicate such variances to the stakeholder.
12.0	Contextual relationship between the project and the organization that hosts the project. The student will be able to:
12.01	Describe how to manage a project in a matrix organizational structure, and illustrate how to successfully deliver a project when the PM might not be sufficiently empowered.
12.02	Demonstrate knowledge of key linkages between organizational and project-level issues, including decision making, motivation, and project roles.
12.03	Demonstrate knowledge and skills in procurement, supply-chain management, finance, cost management, and other business aspects of projects.
13.0	Ethical considerations in every aspect of a project's operations. The student will be able to:

13.01	Given a case study scenario involving ethical considerations, demonstrate how a project can be executed according to the standards of the organization hosting the project.
13.02	Demonstrate knowledge of situations involving unethical project activities, and best practices for whistle blowing and ethical decision making.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Technology Project Manager**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0511100502
Program Type	College Credit
Program Length	24 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate is part of the Technology Project Management AS degree program (1511100509).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as project managers and professionals incorporating IT project management strategies in their business activities in the Information Technology career cluster; provides technical skill proficiency, and competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to balance of business and technology components and allows the student to gain additional skills in the area of Project Management.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 24 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstration in, and implementation of the main areas of information technology.
02.0 Interactive IT tools covering media, graphics, communications, word processing, spreadsheets, and presentation software skills.
03.0 Project costs and budgeting.
04.0 Human resources management activities.
05.0 Fundamentals of project management.
06.0 Full project life cycle and various project management processes.
07.0 Define stakeholder expectations and initiate a project successfully.
08.0 Create a comprehensive project plan.
09.0 Work in teams, manage team members, and interact with stakeholders.
10.0 Plan and monitor project budget and schedule.
11.0 Basic tools and techniques of managing project quality and risk.
12.0 Principles of identifying, developing, and managing resources.
13.0 Navigating a project experiencing scope, resource, and scheduling constraints through effective communication.
14.0 Technical and human aspects of project control, with a focus on change control.
15.0 Contextual relationship between the project and the organization that hosts the project.
16.0 Ethical considerations in every aspect of a project's operations.

Florida Department of Education
Student Performance Standards

Program Title: **Technology Project Manager**
CIP Number: **0511100502**
Program Length: **24 credit hours**

This certificate is part of the Technology Project Management AS degree program (1511100509). At the completion of this program, the student will be able to:	
01.0	Demonstration in, and implementation of the main areas of information technology. The student will be able to:
01.01	Identify, use and connect hardware components and devices.
01.02	Demonstrate the proper use and maintenance of PC hardware.
01.03	Install & configure laptops and other mobile devices.
01.04	Explain types of networks and connections including TCP/IP, WIFI and SOHO.
01.05	Troubleshoot device and network issues.
01.06	Identify and protect against security vulnerabilities for devices and their network connections.
01.07	Install and support Windows OS.
01.08	Understand Mac OS, Linux and mobile OS.
01.09	Follow best practices for safety, environmental impacts, and communication and professionalism.
02.0	Interactive IT tools covering media, graphics, communications, word processing, spreadsheets, and presentation software skills. The student will be able to:
02.01	Describe various interactive media tools and define their purpose and function.
02.02	Demonstrate knowledge in opening, running and/or creating video clips and sound clips.
02.03	Demonstrate knowledge of word processing software to create and modify documents in a collaborative environment.
02.04	Demonstrate knowledge of spreadsheet software to create and modify workbooks to manipulate and analyze data.
02.05	Demonstrate knowledge of presentation software to create and modify interactive presentations.
02.06	Demonstrate the ability to work in an electronic collaborative environment.
02.07	Demonstrate proficiency with project management software.
03.0	Project costs and budgeting. The student will be able to:
03.01	Demonstrate an understanding of the basic accounting principles and practices.
03.02	Demonstrate an understanding of budgeting.

	03.03 Demonstrate an understanding of costing.
	03.04 Identify fundamental financial analysis concepts.
	03.05 Describe financial analysis tools.
	03.06 Understand and interpret financial reports.
04.0	Human resources management activities. The student will be able to:
	04.01 Describe the importance of human resources.
	04.02 Describe the components of the job requirement and analysis process.
	04.03 Describe the important elements of effective human resource planning.
	04.04 Apply leadership techniques and defend the use of appropriate practices for motivating teams and developing leadership abilities.
05.0	Fundamentals of project management. The student will be able to:
	05.01 Describe the importance of PM in the context of various organizational cultures and strategies, and summarize the typical components of the PM system and the processes that are considered essential to any project.
	05.02 Select and describe an appropriate PM strategy for a new project that can meet stakeholder expectations in a given organizational context.
06.0	Full project life cycle and various project management processes. The student will be able to:
	06.01 List and describe the project phases that make up a typical project, and summarize PM processes that occur within each.
	06.02 Describe the typical PM process documentation and PM deliverables that are produced by project managers in each project phase.
07.0	Define stakeholder expectations and initiate a project successfully. The student will be able to:
	07.01 Given an organizational context, project objectives, and recommended strategy, develop a sequence of categorized PM processes and activities that will meet stakeholder expectations.
	07.02 Create, or identify, a project charter and its primary components, including writing a concise statement of business needs that the project will address.
08.0	Create a comprehensive project plan. The student will be able to:
	08.01 Develop a PM plan that documents the actions necessary to define, coordinate, and measure all project activities, and to ensure control and management of costs and changes to the project.
	08.02 Describe the components of the project plan and the interactions of the various processes of the project plan with other processes in the PM system.
09.0	Work in teams, manage team members, and interact with stakeholders. The student will be able to:
	09.01 Select appropriate communication tools and methods to communicate with identified stakeholders, including commonly used templates for communication activities such as status reporting, issues tracking, change control, and project reviews.
	09.02 Understand sources of conflict and, given a specific challenge, apply a problem-solving process that focuses on confronting and resolving the problem.

10.0	Plan and monitor project budget and schedule. The student will be able to:
	10.01 Identify necessary labor and material resources, including contracted resources, and estimate how many units of each are required to meet project expectations.
	10.02 Describe the fundamental types of time- and cost-estimating approaches and how these are best related to the time line of the project, becoming more specific as more information is known about project requirements, risks, and activities.
11.0	Basic tools and techniques of managing project quality and risk. The student will be able to:
	11.01 Given a specific project context and plan, identify potential project risks and/or opportunities, evaluate each according to criteria for impact on the project, and document them in a prioritized risk register.
	11.02 Demonstrate knowledge of the core quality processes and explain the role of each process in planning and managing projects.
12.0	Principles of identifying, developing, and managing resources. The student will be able to:
	12.01 Demonstrate how teams are assigned and formed, and describe the stages of team development.
	12.02 Enhance team capability after assessing personal strengths and weaknesses, and develop skills to manage a team and lead others.
13.0	Navigating a project experiencing scope, resource, and scheduling constraints through effective communication. The student will be able to:
	13.01 Demonstrate ability to optimize the project schedule by allocating resources to the critical path.
	13.02 Demonstrate ability to optimize schedules to maximize efficiency.
14.0	Technical and human aspects of project control, with a focus on change control. The student will be able to:
	14.01 Demonstrate knowledge of how changes to project scope may affect the project's schedule, cost, and quality, and how to evaluate the impact and recommend a solution that produces the desired project product.
	14.02 Describe how to monitor and control variances as they pertain to project cost, schedule, scope, and quality, and how to formally communicate such variances to the stakeholder.
15.0	Contextual relationship between the project and the organization that hosts the project. The student will be able to:
	15.01 Describe how to manage a project in a matrix organizational structure, and illustrate how to successfully deliver a project when the PM might not be sufficiently empowered.
	15.02 Demonstrate knowledge of key linkages between organizational and project-level issues, including decision making, motivation, and project roles.
	15.03 Demonstrate knowledge and skills in procurement, supply-chain management, finance, cost management, and other business aspects of projects.
16.0	Ethical considerations in every aspect of a project's operations. The student will be able to:
	16.01 Given a case study scenario involving ethical considerations, demonstrate how a project can be executed according to the standards of the organization hosting the project.
	16.02 Demonstrate knowledge of situations involving unethical project activities, and best practices for whistle blowing and ethical decision making.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Data Science Technician**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0530700100
Program Type	College Credit Certificate (CCC)
Program Length	36 credit hours
CTSO	BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Data Science Technology AS degree program (1530700100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to in-depth instruction on activities performed in the modeling, visualization and analysis of acquired data, and extraction of knowledge or insights using statistical processes and systems. Additional topics include advanced acquisition, preprocessing, and transformation processes used with data sources. The program offers transient and professional students the opportunity to demonstrate their Data Science Technology knowledge by completing relevant coursework in data acquisition, manipulation, and analytics.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 36 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will have demonstrated mastery the following student learning outcomes:

01.0 Describe statistical concepts and apply statistical methods used in data science problems.
02.0 Describe acquisition, preprocessing, and transformation processes used with data sources.
03.0 Describe modelling, analysis, and visualization techniques applied to acquired data.

Florida Department of Education
Student Performance Standards

Program Title: **Data Science Technician**
CIP Number: **0530700100**
Program Length: **36 credit hours**

This certificate program is part of the Data Science Technology AS degree program (1530700100). At the completion of this program, the student will be able to:	
01.0	Describe statistical concepts and apply statistical methods used in data science problems. The student will be able to:
01.01	Describe the difference between population and sample data.
01.02	Construct frequency distributions.
01.03	Use descriptive statistical methods to analyze sets of data.
01.04	Use probability rules to solve probability problems.
01.05	Solve problems involving discrete probability distributions including the binomial probability distribution.
01.06	Construct confidence intervals from sample data.
01.07	Conduct tests of hypotheses with one and two samples.
01.08	Use correlation and linear regression methods to analyze data.
02.0	Describe selection, collection, preprocessing, and transformation processes used with data sources. The student will be able to:
02.01	Describe and utilize data preprocessing and normalization:
	• Describe and apply common techniques for cleaning textual, numeric, and categorical data.
	• Describe the use of probabilistic methods and decision trees for classification.
	• Describe the use and applicability of transformations used to normalize data distributions.
02.02	Describe OLTP (Online Transaction Processing) design concepts and principals.
02.03	Use data processing tools (e.g., SAS, PowerBI, Tableau, etc.) or programming languages (e.g., Python, R, Java, etc. and associated libraries) to collect and clean data from various sources.
03.0	Describe modelling, analysis, and visualization techniques applied to acquired data. The student will be able to:
03.01	Describe and apply the use of linear regression and decision trees in data modeling.
03.02	Develop data cubes utilizing SQL Server Reporting Services (SSRS).
03.03	Use statistical tools (e.g., SAS, SPSS, etc.) or programming languages (e.g., R, Python, etc. with associated libraries) to solve various statistical problems:

	• Calculate summary statistics.
	• Calculate correlation values.
	• Construct confidence intervals from sample data.
	• Construct confidence intervals from sample data.
	• Conduct tests of hypotheses with one and two samples.
	• Use correlation and linear regression methods to analyze data.
03.04	Describe the advantages of large-scale data analysis tools (e.g., Apache Hadoop, Apache Spark, Google BigQuery, Data Torrent RTS, etc.) for solving data science problems.
03.05	Use data visualization tools (e.g., Tableau, PowerBI, SAS, etc.) or programming languages (e.g., R, JavaScript, Python, Java, etc. with associated libraries) to create graphical representations of data models and analysis results.
	• Determine appropriate reporting formats.
03.06	Develop dashboards utilizing reporting tools (e.g., SharePoint, Tableau, PowerBI, etc.).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **FinTech Technician**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0530710400
Program Type	College Credit Certificate (CCC)
Program Length	33 credit hours
CTSO	BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Data Science Technology AS degree program (1530700100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to foundational instruction on activities performed in the development of applications and acquisition and analysis of data related to finance and banking technology. The program is designed to meet industry demand for students with students with advanced technical skills required by emerging FinTech-related occupations. This program is designed to emphasize the use of application programming interfaces (APIs) for accessing, manipulating, and analyzing financial data.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 33 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will have demonstrated mastery the following student learning outcomes:

01.0 Describe the data life cycle.
02.0 Describe selection, preprocessing, and transformation processes used with data sources.
03.0 Describe modeling, analysis, and visualization techniques applied to acquired data.
04.0 Describe security best practices for each phase of acquisition, analysis, and retention of data.

Florida Department of Education
Student Performance Standards

Program Title: **FinTech Technician**
CIP Number: **0530710400**
Program Length: **33 credit hours**

This certificate program is part of the Data Science Technology AS degree program (1530700100). At the completion of this program, the student will be able to:	
01.0	Describe the data life cycle. The student will be able to:
01.01	Describe ways in which data can be acquired:
•	Describe data sources and methods for acquiring data.
•	Describe how data is captured (e.g., from control systems devices or Internet of things devices, etc.).
•	Describe how acquired data is cleansed and enriched.
01.02	Describe techniques for analyzing data:
•	Describe data models.
•	Describe techniques used for data visualization.
•	Describe statistical methods which are applied to data to extract useful information.
01.03	Describe how data analysis results can be reported.
•	Describe dashboards and how they can be used to make business decisions.
•	Determine appropriate reporting formats
02.0	Describe selection, collection, preprocessing, and transformation processes used with data sources. The student will be able to:
02.01	Describe criteria and procedures used for data selection.
02.02	Compare attributes and benefits of data sources and associated collection strategies including:
•	Structured and unstructured data.
•	RDBMS (Relational Database Management Systems).
•	Data warehouses and OLAP (Online Analytical Processing) Cubes.
•	Spreadsheets.
•	XML (eXtensible Markup Language) data.
•	CSV (Comma Separated Values) data.
•	Web data.

		• GIS (Geographical Information Systems) data.
		• Raw data.
	02.03	Describe and utilize data preprocessing and normalization.
		• Describe and apply common techniques for cleaning textual, numeric, and categorical data.
		• Describe the use and applicability of transformations used to normalize data distributions.
	02.04	Describe OLTP (Online Transaction Processing) design concepts and principals.
	02.05	Use data processing tools (e.g., SAS, PowerBI, Tableau, etc.) or programming languages (e.g., Python, R, Java, etc. and associated libraries) to collect and clean data from various sources.
	02.06	Collect and transform financial data from the web using a Restful API.
03.0	Describe modelling, analysis, and visualization techniques applied to acquired data. The student will be able to:	
	03.01	Use statistical tools (e.g., SAS, SPSS, etc.) or programming languages (e.g., R, Python, etc. with associated libraries) to solve various statistical problems:
		• Calculate summary statistics.
		• Calculate correlation values.
		• Construct confidence intervals from sample data.
		• Construct confidence intervals from sample data.
		• Conduct tests of hypotheses with one and two samples.
		• Use correlation and linear regression methods to analyze data.
	03.02	Use data visualization tools (e.g., Tableau, PowerBI, SAS, etc.) or programming languages (e.g., R, JavaScript, Python, Java, etc. with associated libraries) to create graphical representations of data models and analysis results.
04.0	Describe security best practices for each phase of acquisition, analysis, and retention of data. The student will be able to:	
	04.01	Demonstrate understanding of basic security principles including general security concepts, communication security, confidentiality, authentication and other cryptography concepts, and operational and organizational security.
	04.02	Describe risks associated with data privacy and integrity.
	04.03	Describe basic web security.
	04.04	Describe security methodologies as they relate to data protection and availability.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Geographic Information System**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0545070213
Program Type	College Credit Certificate (CCC)
Program Length	21 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Computer Information Technology AS degree program (1511010307).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the creation of maps; creation of geographic data files; manipulation of geographic data; and analysis of geographic data using appropriate software.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 21 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform general computer application activities.
02.0 Demonstrate an understanding of geographic coordinate systems.
03.0 Perform map creation activities.
04.0 Perform GIS data file creation activities.
05.0 Perform GIS data file manipulation activities.
06.0 Perform GIS spatial analysis activities.
07.0 Perform database operations.

Florida Department of Education
Student Performance Standards

Program Title: **Geographic Information System**
CIP Number: **0545070213**
Program Length: **21 credit hours**

This certificate program is part of the Computer Information Technology AS degree program (1511010307). At the completion of this program, the student will be able to:	
01.0	Perform general computer application activities. The student will be able to:
01.01	Select the most efficient method of file organization for a given situation.
01.02	Identify security procedures to maintain integrity of files.
01.03	Create reports using a word processing application.
01.04	Analyze numerical information using a spreadsheet application.
01.05	Create a database for storing information using a database application.
01.06	Communicate using an e-mail program.
01.07	Retrieve information from the Internet.
02.0	Demonstrate an understanding of coordinate systems. The student will be able to:
02.01	Differentiate between different models for the shape of the earth.
02.02	Describe the characteristics of a global coordinate system.
02.03	Describe the characteristics of a geographic datum.
02.04	Compare and contrast different map projections.
02.05	Detail the characteristic of the Cartesian coordinate system.
02.06	Detail the UTM (Universal Transverse Mercator), UPS (Universal Polar Stereographic) and State Plane coordinate systems.
03.0	Perform map creation activities. The student will be able to:
03.01	Set the appropriate geographic coordinate system for a map in the GIS (Geographic Information System) application.
03.02	Add geographic data layers to a GIS application.
03.03	Manipulate data files that do not align correctly.
03.04	Symbolize each layer appropriately.
03.05	Label map features as needed.

	03.06 Add map components such as legends, titles, scale bars, north arrows.
	03.07 Publish the complete map in paper and electronic formats.
04.0	Perform GIS data file creation activities. The student will be able to:
	04.01 Subset existing GIS data files to create new files.
	04.02 Combine existing, adjacent GIS data files together to create new files.
	04.03 Collect coordinate information using a GPS (Global Positioning Satellite) receiver in the correct geographical coordinate system.
	04.04 Create new GIS data files using coordinate information.
	04.05 Register aerial photographs or satellite images to a specific geographical coordinate system.
	04.06 Create new GIS data files by digitizing on top of registered images.
	04.07 Create LIDAR (Light Detection and Ranging) measurements.
05.0	Perform GIS data file manipulation activities. The student will be able to:
	05.01 Create, delete, and move GIS files between folders and computers.
	05.02 Add metadata to GIS files.
	05.03 Set coordinate system information for a GIS file.
	05.04 Reproject GIS files to different coordinate systems.
	05.05 Add and delete fields to a GIS database.
	05.06 Manipulate values of field within the GIS database.
06.0	Perform GIS spatial analysis activities. The student will be able to:
	06.01 Generalize maps by merging adjacent areas if they contain the same or similar attributes.
	06.02 Overlay GIS files that cover the same area to create new files.
	06.03 Create buffers around map features.
	06.04 Manipulate digital elevation models (DEMs) to create slope, aspect, viewshed, and hillshade layers.
	06.05 Create density maps from point features.
	06.06 Interpolate point features to create continuous surfaces.
	06.07 Generate spatial statistics on GIS files.
07.0	Perform database operations. The student will be able to:
	07.01 Query, display, and format data.

07.02	Save, retrieve, and run queries.
07.03	Build and format reports.
07.04	Group and summarize data.
07.05	Insert, update, generate, and delete data.
07.06	Create, confirm, modify, and remove tables to store data.
07.07	Apply business rules to ensure data integrity.
07.08	Restrict user access to tables.
07.09	Improve query performance.
07.10	Develop programs in PL/SQL.
07.11	Insert and manipulate data with PL/SQL.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Virtual & Augmented Reality Technologies**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0550041118
Program Type	College Credit Certificate (CCC)
Program Length	19 credit hours
CTSO	PBL
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Game Development Design AS degree program (1550041100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to stereoscopic image acquisition, game engines and their uses, basic techniques for creating interactive applications and how these techniques can be used for Virtual Reality (VR) and Augmented Reality (AR) projects. It mixes together knowledge from a variety of correlated topics, including computer graphics, tracking systems, and perceptual psychology. It targets the key areas of augmented reality (AR) and how to enhance real life objects and environments with digitally generated image overlays. Practical experiences in simulation conceptualization, design, development methodologies, essential programming techniques, Science, Computer Programming, Math, 2D and 3D development are embedded throughout the program to emphasize the relationship between these areas and the field of immersive technologies.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 19 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify the tools used in game development.
02.0 Create simple 3D game environments.
03.0 Develop VR/AR Games.
04.0 Demonstrate an understanding of Game Systems.

Florida Department of Education
Student Performance Standards

Program Title: **Virtual and Augmented Reality Technologies**
CIP Number: **0550041118**
Program Length: **19 credit hours**

This certificate program is part of the Game Development Design AS degree program (1550041100). At the completion of this program, the student will be able to:	
01.0	Identify the tools used in game development. The student will be able to:
01.01	Identify different computer programming languages used for game development.
01.02	Review different development environments for game development.
02.0	Create simple 3D game environments. The student will be able to:
02.01	Reproduce simple objects in different coordinate systems.
02.02	Manipulate screen coordinates to create new game levels.
02.03	Convert and export objects and levels between different 3D environments.
02.04	Create simple shapes and structures that can be exported to games or game editors.
02.05	Modify an existing level in a game using editing tools.
02.06	Create a level that can be ported to an existing game engine or editor.
02.07	Create conditional statements and loops for games.
02.08	Modify sprites to add simple motion to games.
02.09	Develop a simple 2D side scrolling game using a game development software kit.
03.0	Develop VR/AR Games. The student will be able to:
03.01	Examine the origins, history, and future of VR/AR applications for games.
03.02	Recognize the key milestones in the evolution of Virtual Reality and Augmented Reality.
03.03	Discuss the advantages and disadvantages of VR/AR applications.
03.04	Recognize the hardware used to acquire and display VR/AR content
03.05	Explain the protocols, principals, and techniques that are necessary to design VR/AR games to work on different platforms
03.06	Evaluate a variety of VR/AR game development topics, including basic game design, layout, and controls.
03.07	Identify the best-case and worst-case scenarios when producing VR/AR applications

	03.08	Examine the process of how VR/AR applications are designed for a specific end user.
	03.09	Conduct a project management process to complete the development of a VR/AR application
	03.10	Discuss issues of quality assurance, detect application errors, bug fixes, and overall application improvement.
	03.11	Use a game engine to create a cross-platform VR/AR application.
	03.12	Researching different VR/AR platforms.
	03.13	Develop the basics of 3D graphics, how to create objects, and how to lay them out to create a VR/AR environment.
	03.14	Identify devices that can be used to experience VR/AR
	03.15	Identify the key differences between VR/AR.
	03.16	Evaluate why VR is now more successful than it was during its initial conception.
04.0	Demonstrate an understanding of Game Systems. The student will be able to:	
	04.01	Explain the different types of game systems and their effect on gameplay.
	04.02	Explain the importance of balance in systems.
	04.03	Explain the importance of the metagame to elder players and how balance can be broken over the short term to create better metagaming experiences over the long term
	04.04	Identify the differences between game parameters, rules, and content.
	04.05	Identify the monetization strategies available for mobile games.
	04.06	Explain how to design for mobile resolutions, touch screen and mobile form factors
	04.07	Explain player progression and game state management in mobile games.
	04.08	Explain the different roles of probability within game systems and why it is in the best interest of the designer to be able to predict the outcomes of player actions.
	04.09	Explain common fallacies associated with probability in games, with a special emphasis on the fallacy of equipartition.
	04.10	Explain independent and related events in probability, and conditional probability.
	04.11	Explain the game core loops and how systems are related to the greater play experience.
	04.12	Identify different types of systems that exist in games and discussing how these systems affect each other.
	04.13	Identify data from systems and discuss how data can be used to inform balancing and future design.
	04.14	Explain contemporary techniques to use external game analytic APIs to measure pleasure progress and validate game design choices
	04.15	Explain the relationship between balancing parts and balanced game mechanics.
	04.16	Model a game system using probability and discussing the likelihood events will occur given certain conditions.

04.17	Test systems with a significant sample and verifying that systems behaviors are predictable.
04.18	Collect data and discussing the results.
04.19	Create workbooks of spreadsheets that model systems.
04.20	Develop spreadsheets with scripts that allow a user to predict the outcome of a system given certain player actions.
04.21	Test and balance their system models.
04.22	Explain how the creation of iterative prototypes aid in validating gameplay design choices.
04.23	Explain how mechanics can be used to tell a story in games and the “do, don’t show” principle of game storytelling.
04.24	Explain cussing an interest curve in games and how mechanics can be used to maintain interest over time as well as how these concepts fit in with different storytelling models.
04.25	Analyze an existing game and discussing how mechanics and systems could be used to tell the story more effectively through player action.
04.26	Discuss player progressions and immersion in games and how these concepts relate to mechanics and systems.
04.27	Modify an existing design document to incorporate balanced mechanics that add to gameplay.
04.28	Develop system documentation for a game design document.
04.29	Reference systems documentation effectively and using models to justify game design choices.
04.30	Create technical documentation that gives developer’s insight into their systems design (such as relevant equations and interrelationships) so that systems can be effectively developed.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Business Intelligence Professional**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0552130101
Program Type	College Credit Certificate (CCC)
Program Length	20 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This certificate program is part of the Business Intelligence Specialist AS degree program (1530700101).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in documenting specifications for business reports; locating, acquiring and modeling data for analysis and output; building and generating reports; and business intelligence techniques.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 20 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Provide standard report specifications and generate standard or custom reports that summarize business, financial, or economic data for review by stakeholders.
02.0 Define and differentiate among data constraints, filters, exception threshold, and data organization factors important in the creation of a report.
03.0 Locate, acquire, and model the data for analysis and output.
04.0 Compare and contrast the various forms for report presentation.
05.0 Describe the advantages and disadvantages for various report delivery mechanisms.
06.0 Reassess current business intelligence or trend data in support of altered information needs.

Florida Department of Education
Student Performance Standards

Program Title: **Business Intelligence Professional**
CIP Number: **0552130101**
Program Length: **20 credit hours**

This certificate program is part of the Business Intelligence Specialist AS degree program (1530700101). At the completion of this program, the student will be able to:
01.0 Provide standard report specifications and generate standard or custom reports that summarize business, financial, or economic data for review by stakeholders. The student will be able to:
01.01 Compare attributes and benefits of available data sources:
• RDBMS
• Data warehouse and OLAP Cubes
• Spreadsheet
• XML
• CSV
• Web service
• Raw Data and other (KML/Shape)
01.02 Define report data elements/requirements (metadata):
• Dimensions
• Type I (As is – current)
• Type II (Historical – slowly changing)
• Facts
• Base
• Summaries
• Calculated fields
• Periodicity
• Relationships/JOINs
01.03 Describe how data is to be used:
• Data mining

	• Filtering
	• Exception threshold alerts
	• Aggregating
	• Snapshot
	• Dynamic
	• Historical/archive/disposal
01.04	Determine the form of analysis:
	• Comparative analysis
	• Impact analysis
	• Correlational (affinity) analysis
	• Trending/Forecasting
02.0	Define and differentiate among data constraints, filters, exception threshold, and data organization factors important in the creation of a report. The student will be able to:
02.01	Distinguish between data constraints and filters and their appropriate use.
02.02	Describe how each of the following data constraints relates to the creation and/or delivery of a report:
	• Size of recordset (scope & performance)
	• Time/period (end points and span)
	• Range (e.g., # of records)
	• Data element (e.g., type, size)
	• Localization (programming & display language)
02.03	Describe how each of the following types of filters may be used to refine or enhance a report:
	• Dimensions (Type I and Type II)
	• Facts (e.g., base, summaries, calculated fields)
02.04	Illustrate how the use of an exception threshold contributes to the operational effectiveness of a report.
	• Display or action dependent on threshold.
	• Triggers alert or advance warning of approaching static threshold.
	• Highlights results exceeding dynamic threshold.
02.05	Compare and contrast the following forms of data organization in terms of representation and analysis of data results:

	• GROUP BY
	• ORDER BY (SORT)
	• Concatenation/substring
	• KRAN
03.0	Locate, acquire, and model the data for analysis and output. The student will be able to:
03.01	Identify the types of data that might be used to create business intelligence reports in support of the organization's business and financial strategic goals:
	• Inventory repositories
	• Sales data
	• Customer data
	• Employee/staffing data
	• Financial data
	• Spatial data
	• Security and Risk
03.02	Describe the risks and potential areas of concern related to the use of external data.
	• Integrity/validity of data.
	• Legality of data availability.
	• Privacy issues of data acquired.
	• Confidentiality of acquisition.
03.03	Describe potential issues, concerns, and obstacles associated with the use of data sources:
	• Data form
	• Data integrity
	• Normalization
	• Cleaning
03.04	Describe the role and implications of standardization relative to internal and external data sources.
	• Describe the need for data typing and transformation.
	• Describe the methods by which transformation may be accomplished.
04.0	Compare and contrast the various forms for report presentation. The student will be able to:

	04.01 Describe the form of data required for using a report generator.
	04.02 Describe the form of data required for using a spreadsheet.
	04.03 Describe the form of data required for using a database.
	04.04 Describe the form of data required for using an OLAP Cube or hypercube.
	04.05 Describe the attributes of a report suitable for presentation in HTML/Flash.
	04.06 Describe the form of data required for using a graph.
	04.07 Describe the form of data required using a dashboard interface.
05.0	Describe the advantages and disadvantages for various report delivery mechanisms. The student will be able to:
	05.01 Email.
	05.02 Web-based.
	05.03 Mobile device.
	05.04 Intranet.
	05.05 Print/PDF.
	05.06 Oral presentation.
06.0	Reassess current business intelligence or trend data in support of altered information needs. The student will be able to:
	06.01 Identify and relate report design constraints and their relationship to data.
	06.02 Evaluate current technology in terms of compatibility and capacity for meeting new or evolving information needs.
	06.03 Re-construct report based on alternative parameters.
	06.04 Adapt and validate report based on new requirements.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Computer Information Data Specialist**
Career Cluster: **Information Technology**

College Credit Certificate	
CIP Number	0611050101
Program Type	College Credit Certificate (CCC)
Program Length	9 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to prepare students for initial employment as a computer systems analyst. This program may also be used to provide supplemental training for persons previously or currently employed in these occupations.

This certificate program is part of the Computer Information Technology AS degree program (1511010307).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to microcomputer oriented operating procedures, software applications packages, and hardware in order to select the appropriate information technology equipment for a particular microcomputer-based work environment; install information technology equipment, troubleshoot information technology equipment, and support information technology users.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document

Program Structure

This program is a planned sequence of instruction consisting of 9 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Install, configure, upgrade and troubleshoot computer hardware.
02.0 Install, configure and troubleshoot software system and device driver software and implement basic security measures.
03.0 Create and maintain a database.
04.0 Demonstrate proficiency in supporting Windows users.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Information Data Specialist**
CIP Number: **0611050101**
Program Length: **9 credit hours**

This certificate program is part of the Computer Information Technology AS degree program (1511010307). At the completion of this program, the student will be able to:	
01.0	Install, configure, upgrade and troubleshoot computer hardware. The student will be able to:
01.01	Describe the architecture and operation of a typical computer system.
01.02	Describe the use of binary numbers to represent instructions and data, and the related hardware implications.
01.03	Identify various hardware encoding schemes.
01.04	Describe and identify motherboards and their components.
01.05	Describe the features and types of computer form factors, chassis, power supplies and cooling devices.
01.06	Describe and identify mass storage devices.
01.07	Distinguish between the different display devices and their characteristics.
01.08	Summarize the function and types of adapter and interface cards.
01.09	Demonstrate the construction and configuration of a computer system from individual components.
01.10	Demonstrate the installation, configuration, optimization, and upgrading of components in portable devices.
01.11	Demonstrate the installation, configuration, optimization, maintenance, and upgrading of printers and other peripheral devices.
01.12	Troubleshoot new and existing computers and peripheral devices, and document the problems discovered and the solutions implemented.
01.13	Troubleshoot client-side network connectivity issues using appropriate tools.
01.14	Identify potential hazards and implement proper safety procedures, including electrostatic discharge (ESD) precautions and professional operational procedures, safe work environment and equipment handling.
01.15	Describe the steps for updating firmware on hardware components.
01.16	Install, configure and monitor updates, and perform system audits.
02.0	Install, configure and troubleshoot software system and device driver software and implement basic security measures. The student will be able to:
02.01	Describe the various types of device drivers used by operating systems and the utilities used to install, configure, manage, upgrade and troubleshoot system devices.
02.02	Describe the device and driver installation process.

	02.03	Demonstrate the installation, configuration, and troubleshooting of device drivers.
	02.04	Verify digital signatures of device drivers.
	02.05	Demonstrate the configuration of driver policies.
	02.06	Describe the security tools and features in operating systems and how to access them to perform a security audit and update.
	02.07	Install, configure, and monitor firewalls and other security measures and policies to block dangerous or malicious incoming and outgoing network traffic.
	02.08	Install, configure and monitor anti-virus software.
	02.09	Perform anti-virus and other security scanning activities to prevent the infiltration of spyware and other malicious software.
	02.10	Perform preventive maintenance and activity monitoring for computer and network security.
	02.11	Identify the ways in which a virus can infect electronic devices.
	02.12	Describe common threats to the security of electronic devices.
03.0	Create and maintain a database. The student will be able to:	
	03.01	Define what a database is and describe the components and structures of relational databases.
	03.02	Explain the fundamental concepts of database design.
	03.03	Design a relational database with multiple tables.
	03.04	Determine the appropriate field data type and field size for fields in a table.
	03.05	Create and modify tables, queries, forms and reports.
	03.06	Insert, update, and delete data and records.
	03.07	Create basic table relationships and relate tables in a database.
	03.08	Identify the data elements by which to relate tables.
	03.09	Describe foreign keys and their use when relating tables.
	03.10	Interpret an entity relationship diagram for modeling a database.
	03.11	Describe the purpose of SQL (Structured Query Language) statements.
	03.12	Define, describe and implement a query.
	03.13	Write and implement basic queries formatted for specific output.
	03.14	Retrieve information from a database by using query and filter tools.
	03.15	Describe the use of SELECT statements including the use of various JOIN, SUBQUERIES, and conditional expressions.
	03.16	Describe the advantages of using an index, and implement different types of indexes on tables.

	03.17	Perform basic database maintenance.
	03.18	Monitor and analyze database performance.
	03.19	Backup and restore a database.
04.0	Demonstrate proficiency in supporting Windows users. The student will be able to:	
	04.01	Configure the Windows interface and customize application features to meet user needs, including ADA accessibility.
	04.02	Configure and modify default user settings in Windows and applications to maximize user performance and to comply with business policies.
	04.03	Manage, maintain and backup Windows client computers according to business procedures and user needs without adversely affecting workplace activities.
	04.04	Migrate user data, settings, and profile to a newly deployed and configured Windows computer.
	04.05	Configure, maintain and troubleshoot user account control and authentication issues.
	04.06	Determine whether a client is receiving regularly scheduled updates and resolve issues.
	04.07	Configure and troubleshoot user access to network resources.
	04.08	Perform a system recovery on a user computer and backup user data.
	04.09	Describe methods of identifying and managing user needs and expectations.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

Program Title: **Applied Artificial Intelligence**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511010200
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to comprehensive technical knowledge of artificial intelligence (AI) tools and their real-world applications, as well as understanding the importance of managing the lifecycle of an AI project. Machine learning fundamentals, data collection, classification, and model deployment for natural language processing, the functions of AI virtual assistants, and techniques used in AI for computer vision as domains to build AI solutions are covered. Additional content includes ethics as relevant to the design and implementation of artificial intelligence.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:

- Related AS and AAS degrees.
- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Explain the importance of managing the core phases of an Artificial Intelligence (AI) project lifecycle.
02.0 Describe ethical and socially responsible practices related to the development and deployment of intelligent systems.
03.0 Create and maintain a database.
04.0 Demonstrate fundamental knowledge of programming language(s) for the development of AI solutions.
05.0 Apply fundamental mathematical concepts and topics relevant to AI.
06.0 Describe foundational machine learning concepts.
07.0 Describe data acquisition, preprocessing, and transformation for AI models.
08.0 Describe the use of artificial intelligence tools and how they may be applied to optimize an organization's capabilities.
09.0 Describe the application of basic techniques in computer vision for image classification and object detection.
10.0 Describe the application of basic techniques in natural language processing.
11.0 Recognize the value of AI professionals to exercise emotional intelligence, effective communication, and the ability to embrace change.
12.0 Investigate career opportunities in the field of artificial intelligence.

Florida Department of Education
Student Performance Standards

Program Title: **Applied Artificial Intelligence**
CIP Number: **1511010200**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Explain the importance of managing the core phases of an Artificial Intelligence (AI) project lifecycle. The student will be able to:
01.01	Describe AI life cycle from concept to production.
01.02	Describe the importance of security technologies, processes and practices appropriate for each life cycle phase.
01.03	Describe the history, evolution and various applications of AI technology.
02.0	Describe ethical and socially responsible practices related to the development and deployment of intelligent systems. The student will be able to:
02.01	Recognize the value of developing equitable and fair AI solutions.
02.02	Describe the need for data transparency and responsibility in AI models.
02.03	Describe common major issues of ethical concern in the development and implementation of AI.
02.04	Explain the potential pitfalls in the absence of business policies that address ethics in the development, implementation, and administration of AI.
02.05	Define and compare ethical and legal implications of AI.
02.06	Identify, research, and analyze current events in the field of AI, considering new technology developments, social and ethical impacts, and future implications.
02.07	Identify and describe ethical and societal AI issues in a variety of settings such as public safety, finance, social media, marketing, government, and how these factors may impact different cultures and countries.
03.0	Create and maintain a database. The student will be able to:
03.01	Define the term database and describe the components and structures of relational databases.
03.02	Explain the fundamental concepts of database design.
03.03	Design a relational database with multiple tables.
03.04	Determine appropriate data type and size for fields in a table.
03.05	Create and modify tables, queries, forms and reports.
03.06	Insert, update, and delete data and records.
03.07	Create basic table relationships and relate tables in a database.

	03.08 Describe foreign keys and their use when relating tables.
	03.09 Interpret an entity relationship diagram for modeling a database.
	03.10 Describe the purpose of SQL (Structured Query Language) statements.
04.0	Demonstrate fundamental knowledge of programming language(s) for the development of AI solutions. The student will be able to:
	04.01 Demonstrate an understanding of programming fundamentals.
	04.02 Identify the appropriate use of libraries and packages.
	04.03 Design, code, document, test, and assemble modules.
	04.04 Debug and revise code.
	04.05 Describe security considerations used in application development.
05.0	Apply fundamental mathematical concepts and topics relevant to AI. The student will be able to:
	05.01 Describe common mathematical operations encountered in AI Projects.
	05.02 Demonstrate mathematical operations for given datasets using a programming language.
	05.03 Describe general characteristics and common measures of dispersion for a dataset.
	05.04 Describe common terms encountered in probability.
06.0	Describe foundational machine learning concepts. The student will be able to:
	06.01 Describe the differences between supervised, unsupervised, and reinforcement learning.
	06.02 Describe traditional machine learning algorithms and model development.
	06.03 Describe methods of representation learning and model development.
	06.04 Describe testing and validation of machine learning models.
	06.05 Describe the various libraries available for implementation of machine learning models.
	06.06 Explain the optimization of AI models in various contexts.
07.0	Describe data acquisition, preprocessing, and transformation for AI models. The student will be able to:
	07.01 Utilize various techniques for identifying data requirements.
	07.02 Identify and design a data collection plan.
	07.03 Identify attributes and benefits of data sources and associated collection strategies.
	07.04 Evaluate risks to data privacy, integrity, and availability.
	07.05 Apply methods to evaluate and interpret model outputs.

	07.06 Describe techniques to transform data from multiple sources and formats by utilizing visualization tools and fitting data to models.
	07.07 Identify and assess data readiness.
	07.08 Describe the benefits and disadvantages of data virtualization.
08.0	Describe the use of artificial intelligence tools and how they may be applied to optimize an organization's capabilities. The student will be able to:
	08.01 Utilize knowledge of available AI tools to accomplish specific objectives.
	08.02 Describe potential project pitfalls in tool selection.
	08.03 Identify alternative AI solutions.
	08.04 Explain various deployment strategies.
	08.05 Describe the role and usage of cloud services in AI project development and deployment.
	08.06 Identify trends in emerging AI tools to address the evolving nature of AI systems.
09.0	Describe the application of basic techniques in computer vision for image classification and object detection. The student will be able to:
	09.01 Explore the application of computer vision to real world problems.
	09.02 Describe the data acquisition and exploration processes in computer vision.
	09.03 Outline the functions, applications, and usage of computer vision libraries.
	09.04 Describe the development and applications of Convolution Neural Networks (CNN).
	09.05 Describe an end-to-end Generative Adversarial Networks (GANs) model.
10.0	Describe the application of basic techniques in natural language processing. The student will be able to:
	10.01 Explore the application of natural language processing (NLP) to real world problems.
	10.02 Outline the various stages within the NLP pipeline.
	10.03 Describe algorithms and models used in NLP for speech recognition, language translation, and text analysis.
	10.04 Describe, compare, and apply text classifiers.
	10.05 Describe common platforms to deploy NLP models.
	10.06 Evaluate ethical issues in language models.
11.0	Recognize the value of AI professionals to exercise emotional intelligence, effective communication, and the ability to embrace change. The student will be able to:
	11.01 Describe the role of empathy as an important emotional intelligence skill.
	11.02 Describe how self-awareness and the emotional awareness of others may contribute to positive interactions in the workplace.

	11.03 Explain how cultivating emotional intelligence may lead to better decision-making and problem solving.
	11.04 Utilize clear, concise, courteous, and consistent messages to communicate with stakeholders.
	11.05 Utilize appropriate verbal and non-verbal communication to exchange information.
	11.06 Recognize the need for workplace flexibility and adaptability in the field of AI.
12.0	Investigate career opportunities in the field of artificial intelligence. The student will be able to:
	12.01 Describe job requirements for a variety of occupations within the field of artificial intelligence.
	12.02 Identify current employment trends and career opportunities in the field of artificial intelligence.
	12.03 Analyze government and private sector digital resources to identify jobs, wages, and employment trends for these occupations.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Artificial Intelligence Practitioner (0511010200) - 18 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Computer Information Technology**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511010307
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a PC Support Technician, help desk technician, user support analyst, applications system analyst, information systems specialist, technical support analyst, computer information manager, user support supervisor, computer systems analyst, customer service representative, computer operator, computer repair technicians, computer sales person, help desk office supervisor, office systems support specialist, software tester, software trainer, user support specialist information security specialist in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to analyze microcomputer oriented operating procedures, software applications packages, and hardware in order to devise efficient methods to manage a microcomputer-based work environment; develop new systems to meet projected needs; select and install information technology equipment, troubleshoot information technology equipment, manage and support information technology users.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of two specializations with one common core. It is recommended that students complete the core or demonstrate a mastery of the student performance standards contained in the core before advancing to the course(s) in the next level of specialization. The common core consists of technical core skills from the following areas: computer maintenance and support,

networking fundamentals, operating systems, webpage authoring, database applications and fundamentals of project management. The total Associate in Science (AS) degree program(s) consists of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
  - Related CCC and ATD credentials.
  - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

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Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge of common Information Technology topics.
02.0 Demonstrate employability skills.
03.0 Demonstrate how to use current productivity software applications and tools including word processing, spreadsheets, presentation software, database, email, and internet browser applications.
04.0 Install, configure, upgrade and troubleshoot computer hardware.
05.0 Install, configure and troubleshoot software system and device driver software and implement basic security measures.
06.0 Demonstrate an understanding of Internet structure, organization and navigation and how to support Internet access and applications.
07.0 Install, configure, manage, and troubleshoot an operating system.
08.0 Create and maintain a database.
09.0 Demonstrate knowledge of networking technologies.
10.0 Install, configure, manage, deploy, monitor and troubleshoot a networked server environment.
11.0 Demonstrate foundational knowledge of project management.
12.0 Perform customer service skills.
13.0 Configure, manage, and troubleshoot mobile devices.
14.0 Configure, enable, manage and troubleshoot VPN, mobile, and remote access.

In addition, students will complete the competencies in one of the following specializations:

Information Technology Support Specialization
15.0 Demonstrate proficiency in supporting Windows-based client and network computer systems.
16.0 Demonstrate proficiency in installing, configuring, deploying, and supporting desktop applications.
17.0 Perform help desk support activities.
18.0 Demonstrate proficiency in supporting Windows users.

Information Technology Analysis Specialization
19.0 Perform systems monitoring activities.
20.0 Perform computer information systems analysis activities.

Geographic Information System Specialization
21.0 Perform general computer application activities.
22.0 Demonstrate an understanding of coordinate systems.
23.0 Perform map creation activities.
24.0 Perform GIS data file creation activities.
25.0 Perform GIS data file manipulation activities.
26.0 Perform GIS spatial analysis activities.
27.0 Perform database operations.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Information Technology**
CIP Number: **1511010307**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of common Information Technology topics. The student will be able to:
01.01	Distinguish between appropriate and inappropriate use of technology in a professional or academic setting.
01.02	Describe trends in emerging technologies.
02.0	Demonstrate employability skills. The student will be able to:
02.01	Identify sources of employment, internship, and apprenticeship opportunities, where applicable.
02.02	Describe the job search process.
02.03	Use government digital resources to identify jobs, wage, and employment trends for your occupation.
02.04	Complete a resume and a cover letter.
02.05	Complete an electronic job application form correctly.
02.06	Prepare a resume for electronic distribution.
02.07	Demonstrate effective job interview techniques and identify different types of interviews.
02.08	Identify methods for securing an employment reference.
02.09	Identify pre- and post- interview strategies.
02.10	Identify and demonstrate appropriate responses to feedback from supervisors.
02.11	Identify and demonstrate acceptable work habits.
02.12	Describe the importance of an employee's ability to be flexible in the workplace.
02.13	Demonstrate effective time management skills.
03.0	Demonstrate how to use current productivity software applications and tools including word processing, spreadsheets, presentation software, database, email, and internet browser applications. The student will be able to:
03.01	Create and modify documents using a word processing application.
03.02	Create and modify spreadsheets using a spreadsheet application.
03.03	Create a slideshow for presentation using a presentation application.

	03.04 Create a database, query the data, and generate reports using a database application.
	03.05 Demonstrate sending and receiving email, managing contacts, and managing calendars using a personal information manager.
	03.06 Explain the process to install, configure, and search for information online using web browsers.
04.0	Install, configure, upgrade and troubleshoot computer hardware. The student will be able to:
	04.01 Describe the architecture and operation of a typical computer system.
	04.02 Describe the use of binary numbers to represent instructions and data, and the related hardware implications.
	04.03 Identify various hardware encoding schemes.
	04.04 Describe and identify motherboards and their components.
	04.05 Describe the features and types of computer form factors, chassis, power supplies and cooling devices.
	04.06 Describe and identify mass storage devices.
	04.07 Distinguish between the different display devices and their characteristics.
	04.08 Summarize the function and types of adapter and interface cards.
	04.09 Demonstrate the construction and configuration of a computer system from individual components.
	04.10 Demonstrate the installation, configuration, optimization, and upgrading of components in portable devices.
	04.11 Demonstrate the installation, configuration, optimization, maintenance, and upgrading of printers and other peripheral devices.
	04.12 Troubleshoot new and existing computers and peripheral devices, and document the problems discovered and the solutions implemented.
	04.13 Troubleshoot client-side network connectivity issues using appropriate tools.
	04.14 Identify potential hazards and implement proper safety procedures, including electrostatic discharge (ESD) precautions and professional operational procedures, safe work environment and equipment handling.
	04.15 Describe the steps for updating firmware on hardware components.
	04.16 Install, configure and monitor updates, and perform system audits.
05.0	Install, configure and troubleshoot software system and device driver software and implement basic security measures. The student will be able to:
	05.01 Describe the various types of device drivers used by operating systems and the utilities used to install, configure, manage, upgrade and troubleshoot system devices.
	05.02 Describe the device and driver installation process.
	05.03 Demonstrate the installation, configuration, and troubleshooting of device drivers.
	05.04 Verify digital signatures of device drivers.
	05.05 Demonstrate the configuration of driver policies.

	05.06 Describe the security tools and features in operating systems and how to access them to perform a security audit and update.
	05.07 Install, configure, and monitor firewalls and other security measures and policies to block dangerous or malicious incoming and outgoing network traffic.
	05.08 Install, configure and monitor anti-virus software.
	05.09 Perform anti-virus and other security scanning activities to prevent the infiltration of spyware and other malicious software.
	05.10 Perform preventive maintenance and activity monitoring for computer and network security.
	05.11 Identify the ways in which a virus can infect electronic devices.
	05.12 Describe common threats to the security of electronic devices.
06.0	Demonstrate an understanding of Internet structure, organization and navigation and how to support Internet access and applications. The student will be able to:
	06.01 Describe the origin, structure, and history of the Internet and the World Wide Web.
	06.02 Identify common Internet organizations.
	06.03 Define and compare web-based marketing techniques.
	06.04 Describe the role of technology in e-commerce.
	06.05 Differentiate among an intranet site, an extranet site, and an Internet site.
	06.06 Characterize the role of the Internet in today's society.
	06.07 Describe several major ethical issues related to Internet use.
	06.08 Identify legal issues related to Internet use.
	06.09 Identify how the Internet affects intellectual property rights.
	06.10 Identify how the Internet affects personal security and privacy.
	06.11 Describe the World Wide Web (WWW).
	06.12 Describe the use of transfer protocols.
	06.13 Describe the use of remote access tools.
	06.14 Describe components of a URL (Uniform Resources Locator).
	06.15 Use Internet tools and utilities effectively.
	06.16 Demonstrate the installation and configuration of an Internet browser.
	06.17 Demonstrate the installation and configuration of browser add-ons and plug-ins.
	06.18 Distinguish between legal and illegal file-sharing practices.
07.0	Install, configure, manage, and troubleshoot an operating system. The student will be able to:

	07.01	Identify the fundamental principles of operating systems.
	07.02	Describe the general features and uses of current operating systems.
	07.03	Compare and contrast features of popular operating systems.
	07.04	Identify the names, locations, purposes, and contents of major operating system files.
	07.05	Use command line functions and utilities to manage the operating system, including proper syntax and switches.
	07.06	Create, view, and manage disks, directories and files, and change file attributes.
	07.07	Identify the major operating system utilities, their purpose, location, and options.
	07.08	Install major operating systems and bring the operating system to a basic operational level.
	07.09	Perform operating system upgrades.
	07.10	Create an emergency boot disk with utilities utilizing basic system boot sequences and boot methods.
	07.11	Optimize the operating system and major operating system subsystems.
	07.12	Distinguish and interpret the meaning of common error codes and startup messages from the boot sequence and identify steps to correct the problems.
	07.13	Recognize when to use common diagnostic utilities and tools.
	07.14	Select and use system utilities and tools to diagnose, troubleshoot, and resolve operating system problems.
	07.15	Detect and resolve common operational and usability problems.
	07.16	Discuss the network protocols used by operating systems.
	07.17	Explain how networking is supported by various operating systems.
	07.18	Configure operating systems to connect to a local area network.
	07.19	Configure operating systems to connect to and use Internet resources.
	07.20	Troubleshoot and diagnose basic network and Internet connectivity problems.
	07.21	Perform file and system management tasks.
08.0	Create and maintain a database. The student will be able to:	
	08.01	Define what a database is and describe the components and structures of relational databases.
	08.02	Explain the fundamental concepts of database design.
	08.03	Design a relational database with multiple tables.
	08.04	Determine the appropriate field data type and field size for fields in a table.
	08.05	Create and modify tables, queries, forms and reports.

	08.06	Insert, update, and delete data and records.
	08.07	Create basic table relationships and relate tables in a database.
	08.08	Identify the data elements by which to relate tables.
	08.09	Describe foreign keys and their use when relating tables.
	08.10	Interpret an entity relationship diagram for modeling a database.
	08.11	Describe the purpose of SQL (Structured Query Language) statements.
	08.12	Define, describe and implement a query.
	08.13	Write and implement basic queries formatted for specific output.
	08.14	Retrieve information from a database by using query and filter tools.
	08.15	Describe the use of SELECT statements including the use of various JOIN, SUBQUERIES, and conditional expressions.
	08.16	Describe the advantages of using an index, and implement different types of indexes on tables.
	08.17	Perform basic database maintenance.
	08.18	Monitor and analyze database performance.
	08.19	Backup and restore a database.
09.0	Demonstrate knowledge of networking technologies. The student will be able to:	
	09.01	Identify the advantages and disadvantages of networked and non-network environments.
	09.02	Describe current networked environments, such as peer-to-peer and client/server.
	09.03	Identify and discuss issues such as security, privacy and redundancy related to networked environments.
	09.04	Identify and discuss issues related to naming conventions for domains, hosts, users, email, mobile devices, and network devices.
	09.05	Differentiate between telecommunications and data communications.
	09.06	List and define the layers in the OSI (Open Systems Interconnect) and TCP/IP (Transmission Control Protocol/Internet Protocol) network protocol models.
	09.07	Identify and describe current relevant IEEE (Institute of Electrical and Electronics Engineers) network standards.
	09.08	Describe and illustrate logical and physical network topologies, and explain the advantages and disadvantages of each topology.
	09.09	Describe the major functions and implementation of LAN (Local Area Network) hardware protocols and identify the physical components currently in use.
	09.10	Describe the LAN software protocols in current use.
	09.11	Discuss the characteristics of IP (Internet Protocol) addresses and MAC (Media Access Control) addresses, and mapping between protocol addressing schemes.

	09.12	Identify and differentiate cable technologies and their features.
	09.13	Identify and differentiate among wireless technologies.
	09.14	Describe the advantages and disadvantages of wireless and cable technologies, and identify the environments best suited for each technology.
	09.15	Describe the functions and characteristics of network hardware.
	09.16	Describe the hardware needed to connect a local area network to a wide area network and the Internet.
	09.17	Compare and contrast major functions and features of network operating systems.
	09.18	Describe the major functions of network server hardware and software components.
	09.19	Describe the major functions of network client hardware and software components.
	09.20	Install and configure network client software on multiple computer platforms with support for multiple network protocols.
	09.21	Describe the function of network storage devices and other peripherals.
	09.22	Describe installation and configuration of storage devices and other peripherals with network access.
	09.23	Describe the installation, configuration, updating, and troubleshooting of network drivers for network hosts and peripherals.
	09.24	Configure and troubleshoot network protocol stacks.
	09.25	Describe the characteristics of the current wide area network technologies and determine the most suitable WAN (Wide Area Network) technology for a given situation.
	09.26	Describe how digital voice communications occur over an Internet Protocol (IP) network (Voice over IP, or VoIP)
10.0	Install, configure, manage, deploy, monitor and troubleshoot a networked server environment. The student will be able to:	
	10.01	Analyze the business environment and select a server deployment and licensing method.
	10.02	Describe the major steps and issues associated with server deployment and draft a server migration strategy.
	10.03	Describe, install and configure the server deployment tools.
	10.04	Perform data and user backup for migration to a new server environment.
	10.05	Prepare, install and test a reference system for the creation of a client image.
	10.06	Configure the reference system’s settings to optimize performance, security, and updates, provide network access and administrative controls, and standardize features to comply with business needs.
	10.07	Create, capture, test and manage the custom image of the reference system.
	10.08	Deploy the reference system to client computers in a networked environment.
	10.09	Migrate current applications and user data after deployment and verify and troubleshoot deployment issues.
	10.10	Configure, manage and troubleshoot device drivers, network settings, peripheral devices and printers.

10.11	Join the client to a domain and configure network policies.
10.12	Describe methods of creating and maintaining network policies.
10.13	Create, modify, and administer users and groups for clients.
10.14	Configure, manage and troubleshoot client mobile features including configuring mobile devices, power management, disk encryption, wireless networking, VPN and remote access.
10.15	Configure, manage and troubleshoot client access to the network, network resources, and the Internet.
10.16	Configure, manage and troubleshoot administrative settings including: group policies, user profiles, permissions, user account control, event viewing, forwarding and logging, task scheduler, performance monitoring, Windows updates, security settings, firewall features, and authentication.
10.17	Analyze business needs and licensing requirements in the selection of enterprise applications for deployment in networked environment.
10.18	Assess hardware requirements and compatibility with existing applications and devices.
10.19	Perform application performance and compatibility testing and troubleshooting prior to application software installation.
10.20	Install and configure business application.
10.21	Deploy single license applications on a client computer.
10.22	Troubleshoot application software installation and compatibility issues.
10.23	Describe the role of desktop support in a network environment.
10.24	Perform management, testing, and troubleshoot activities.
10.25	Document incidents and support activities.
10.26	Perform post-installation tasks, compatibility and reliability testing, resolve performance issues, and perform a security audit.
10.27	Utilize hardware and software installation tools to perform testing, maintenance and updates.
10.28	Perform support functions for clients, users and deployed applications, including end user support and training.
10.29	Configure, manage and monitor administrative features and security settings.
10.30	Document installed software, conduct license auditing, create a performance baseline, and draft a troubleshooting checklist.
10.31	Describe the function of automation scripts for server installation and maintenance activities.
11.0	Demonstrate foundational knowledge of project management. The student will be able to:
11.01	Describe the steps in planning and managing a project.
11.02	Define an implementation schedule for a project.
11.03	Collaborate on group projects.

	11.04 Choose appropriate actions in situations that require effective time management.
	11.05 Describe the five process groups of the project life cycle.
	11.06 Describe the factors that contribute to risk management planning.
	11.07 Explain the cultural, social, international, political, and physical aspects of the project environment.
12.0	Perform customer service skills. The student will be able to:
	12.01 Identify and recognize user's state of mind and attitude.
	12.02 Determine the customer needs using system analysis strategies.
	12.03 Listen to the customer and ask appropriate questions.
	12.04 Maintain professionalism when working with customers and competitors.
	12.05 Provide suggested solutions using knowledge base.
	12.06 Promote company services, products, and policies when appropriate.
	12.07 Maintain professional work ethics and follow policies and procedures.
	12.08 Demonstrate respect for the customer workspace/environment.
	12.09 Relate all information to customer in a manner that the customer can understand.
	12.10 Set realistic expectations when establishing deadlines for customer solutions.
	12.11 Communicate action plan including timelines.
	12.12 Recognize the existence of internal/external customers and follow appropriate guidelines for each.
13.0	Configure, manage, and troubleshoot mobile devices. The student will be able to:
	13.01 Describe mobile device technology.
	13.02 Identify the security measures required for securing mobile devices.
	13.03 Distinguish between mobile device operating systems.
	13.04 Setup and configure mobile devices.
	13.05 Explain the basic differences between mobile devices and how they affect application design.
	13.06 Troubleshoot mobile device configuration and connectivity issues.
14.0	Configure, enable, manage and troubleshoot VPN, mobile, and remote access. The student will be able to:
	14.01 Identify threats associated with VPN, mobile, and remote access.
	14.02 Identify the safety control of remote access.

	14.03 Distinguish between safety countermeasures related to remote access.
	14.04 Setup and configure VPN, mobile, and remote access.
	14.05 Troubleshoot technical problems with VPN, mobile, and remote access.
Information Technology Support Specialization	
15.0	Demonstrate proficiency in supporting Windows-based client and network computer systems. The student will be able to:
	15.01 Describe the features and characteristics of a well-deployed and operational client computer in a Windows networked environment.
	15.02 Perform baseline measurements, perform security and performance audits on a client computer, and document findings.
	15.03 Describe the methods of establishing, configuring, and controlling group policies.
	15.04 Configure and troubleshoot group policy settings for client computers in a Windows domain.
	15.05 Configure, manage, and troubleshoot task scheduler, event forwarding and monitoring tools on a Windows client computer.
	15.06 Test, configure and schedule Windows updates, patches, and service packs prior to and after network-wide deployment.
	15.07 Troubleshoot Windows performance, reliability, and security issues.
	15.08 Configure, manage, maintain, and troubleshoot Windows security.
	15.09 Install, manage, and maintain anti-malicious software, firewalls and access control.
	15.10 Configure, troubleshoot, and secure network protocols and services for Windows client computers.
	15.11 Configure, enable, manage, and troubleshoot VPN, mobile and remote access.
	15.12 Troubleshoot, resolve, and document network issues.
	15.13 Determine the root cause of hardware and software issues.
	15.14 Monitor events in an enterprise network and log incidents.
16.0	Demonstrate proficiency in installing, configuring, deploying, and supporting desktop applications. The student will be able to:
	16.01 Test functionality and compatibility of desktop applications and updates with operating system and the intended enterprise use.
	16.02 Demonstrate the common steps to install desktop applications.
	16.03 Configure and deploy desktop and enterprise applications in a networked environment.
	16.04 Manage software license policies.
	16.05 Perform support functions for deployed applications.
	16.06 Troubleshoot and resolve desktop application issues in a networked environment.
	16.07 Describe how product standards in the IT field emerged.

	16.08 Identify methods for evaluation and selection of products.
17.0	Perform help desk support activities. The student will be able to:
	17.01 Describe the role of the IT support function within the business organization.
	17.02 Describe the incident management process and help desk service best practices when handling incidents.
	17.03 Apply systematic problem-solving and troubleshooting processes to typical end-user issues.
	17.04 Discuss the processes for resolving customer issues.
	17.05 Describe strategies for handling difficult clients and incidents.
	17.06 Identify and select a variety of tools and technologies that aid in the effective management of the help desk function.
	17.07 Describe the process of identifying and resolving customer needs within the context of the business enterprise.
	17.08 Describe the training process of end users and effective methods of delivering training materials.
	17.09 Present and follow oral and written instructions.
	17.10 Participate in group discussions as an IT support specialist and trainer.
	17.11 Describe the types of end user documentation and the process of developing technical instructions for end users.
	17.12 Prepare, outline, and deliver a short IT training presentation.
	17.13 Use appropriate communication skills, courtesy, manners, and dress in the workplace.
	17.14 Customize application features to meet user needs and to comply with ADA.
18.0	Demonstrate proficiency in supporting Windows users. The student will be able to:
	18.01 Configure the Windows interface and customize application features to meet user needs, including ADA accessibility.
	18.02 Configure and modify default user settings in Windows and applications to maximize user performance and to comply with business policies.
	18.03 Manage, maintain and backup Windows client computers according to business procedures and user needs without adversely affecting workplace activities.
	18.04 Migrate user data, settings, and profile to a newly deployed and configured Windows computer.
	18.05 Configure, maintain and troubleshoot user account control and authentication issues.
	18.06 Determine whether a client is receiving regularly scheduled updates and resolve issues.
	18.07 Configure and troubleshoot user access to network resources.
	18.08 Perform a system recovery on a user computer and backup user data.
	18.09 Describe methods of identifying and managing user needs and expectations.

Information Technology Analysis Specialization	
19.0	Perform systems monitoring activities. The student will be able to:
19.01	Create and review back up, server, application, resolution, and security logs.
19.02	Track network performance.
19.03	Identify problem trends and create resolution plans.
19.04	Document statistical analysis and monitoring activities.
20.0	Perform computer information systems analysis activities. The student will be able to:
20.01	Prepare appropriate systems and analysis charts and other visual aids.
20.02	Describe the major steps in the systems development cycle.
20.03	Perform basic business-related tasks using the most appropriate software applications.
20.04	Identify situations where software packages and/or custom developed packages need to be integrated with each other.
20.05	Identify situations where software packages and/or hardware need to be integrated with software/hardware available on other types of computers.
20.06	Select appropriate hardware devices to accomplish assigned tasks.
20.07	Identify appropriate vendor sources for software, hardware, and auxiliary supplies.
Geographic Information System Specialization	
21.0	Perform general computer application activities. The student will be able to:
21.01	Select the most efficient method of file organization for a given situation.
21.02	Identify security procedures to maintain integrity of files.
21.03	Create reports using a word processing application.
21.04	Analyze numerical information using a spreadsheet application.
21.05	Create a database for storing information using a database application.
21.06	Communicate using an e-mail program.
21.07	Retrieve information from the Internet.
22.0	Demonstrate an understanding of coordinate systems. The student will be able to:
22.01	Differentiate between different models for the shape of the earth.
22.02	Describe the characteristics of a global coordinate system.
22.03	Describe the characteristics of a geographic datum.

	22.04 Compare and contrast different map projections.
	22.05 Detail the characteristic of the Cartesian coordinate system.
	22.06 Detail the UTM (Universal Transverse Mercator), UPS (Universal Polar Stereographic) and State Plane coordinate systems.
23.0	Perform map creation activities. The student will be able to:
	23.01 Set the appropriate geographic coordinate system for a map in the GIS (Geographic Information System) application.
	23.02 Add geographic data layers to a GIS application.
	23.03 Manipulate data files that do not align correctly.
	23.04 Symbolize each layer appropriately.
	23.05 Label map features as needed.
	23.06 Add map components such as legends, titles, scale bars, north arrows.
	23.07 Publish the complete map in paper and electronic formats.
24.0	Perform GIS data file creation activities. The student will be able to:
	24.01 Subset existing GIS data files to create new files.
	24.02 Combine existing, adjacent GIS data files together to create new files.
	24.03 Collect coordinate information using a GPS (Global Positioning Satellite) receiver in the correct geographical coordinate system.
	24.04 Create new GIS data files using coordinate information.
	24.05 Register aerial photographs or satellite images to a specific geographical coordinate system.
	24.06 Create new GIS data files by digitizing on top of registered images.
	24.07 Create LIDAR (Light Detection and Ranging) measurements.
25.0	Perform GIS data file manipulation activities. The student will be able to:
	25.01 Create, delete, and move GIS files between folders and computers.
	25.02 Add metadata to GIS files.
	25.03 Set coordinate system information for a GIS file.
	25.04 Reproject GIS files to different coordinate systems.
	25.05 Add and delete fields to a GIS database.
	25.06 Manipulate values of field within the GIS database.
26.0	Perform GIS spatial analysis activities. The student will be able to:

	26.01	Generalize maps by merging adjacent areas if they contain the same or similar attributes.
	26.02	Overlay GIS files that cover the same area to create new files.
	26.03	Create buffers around map features.
	26.04	Manipulate digital elevation models (DEMs) to create slope, aspect, viewshed, and hillshade layers.
	26.05	Create density maps from point features.
	26.06	Interpolate point features to create continuous surfaces.
	26.07	Generate spatial statistics on GIS files.
27.0	Perform database operations. The student will be able to:	
	27.01	Query, display, and format data.
	27.02	Save, retrieve, and run queries.
	27.03	Build and format reports.
	27.04	Group and summarize data.
	27.05	Insert, update, generate, and delete data.
	27.06	Create, confirm, modify, and remove tables to store data.
	27.07	Apply business rules to ensure data integrity.
	27.08	Restrict user access to tables.
	27.09	Improve query performance.
	27.10	Develop programs in PL/SQL.
	27.11	Insert and manipulate data with PL/SQL.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Computer Information Data Specialist (0611050101) – 9 credit hours
Geographic Information System (0545070213) – 21 credit hours
Help Desk Support Technician (0511010313) – 16 credit hours
Information Technology Analysis (0511010312) – 27 credit hours
Information Technology Support Specialist (0511010311) – 18 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year. This program title has changed, formerly Computer Programming and Analysis.

Program Title: **Software Development**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511020101
Program Type	College Credit
Program Length	60 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as software developers, entry level software developers, software developer specialists, entry level programmers, programmer specialists, computer programmers, senior programmers, chief business programmers, programmer analysts, and information systems programmers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content prepares individuals to analyze business situations and to design, develop and write computer programs; to store, locate, and retrieve specific documents, data, and information; analyze problems using logic/analysis tools, code into computer language; test, monitor, debug, document and maintain computer programs.

More than one programming language should be addressed in this degree program.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Perform data file activities.
02.0 Perform analysis activities.
03.0 Perform program design activities.
04.0 Perform coding activities.
05.0 Demonstrate fundamental proficiency in network security essentials.
06.0 Perform testing activities.
07.0 Perform user-training activities.
08.0 Perform implementation activities.
09.0 Perform user-support activities.
10.0 Perform evaluation activities.
11.0 Develop an algorithm that solves a problem.
12.0 Use development methodologies.
13.0 Demonstrate proficiency in the use of AI tools in software development.
14.0 Demonstrate professionalism, employability, and workplace skills.

Florida Department of Education
Student Performance Standards

Program Title: **Software Development**
CIP Number: **1511020101**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Perform data file activities. The student will be able to:
01.01	Identify methods of file organization.
01.02	Select an efficient method of file organization for a given situation.
01.03	Identify security procedures to maintain integrity of files.
01.04	Identify and modify file access/privilege levels (read, write, modify, delete).
02.0	Perform analysis activities. The student will be able to:
02.01	Communicate with users to ascertain system requirements.
02.02	Develop information system requirements to accomplish specific task.
02.03	Analyze and document user requirements.
02.04	List the types of cloud architectures.
02.05	Describe the benefits of cloud software development.
02.06	Identify common technologies used in cloud software development.
02.07	Evaluate alternative solutions.
02.08	Analyze and document system requirements.
02.09	Create a plan for the design phase of an information technology system.
02.10	Develop a timeline for system development.
02.11	Communicate the plan.
02.12	Develop systems specifications.
02.13	Develop systems documentation.
02.14	Identify technical and operational feasibility issues in determining a system solution.
03.0	Perform program design activities. The student will be able to:
03.01	Demonstrate proficiency in design of information technology systems.

	03.02 Describe various components of computer systems.
	03.03 Develop design specifications.
	03.04 Select a feasible development environment.
	03.05 Validate design specifications.
	03.06 Document a design.
	03.07 Communicate design specifications.
	03.08 Develop a prototype.
	03.09 Assist in revisions and enhancements of software systems.
04.0	Perform coding activities. The student will be able to:
	04.01 Identify modules.
	04.02 Design modules.
	04.03 Code modules.
	04.04 Document modules.
	04.05 Test modules.
	04.06 Debug code.
	04.07 Revise code.
	04.08 Assemble modules.
	04.09 Demonstrate proficient use of programming development tools.
05.0	Demonstrate fundamental proficiency in network security essentials. The student will be able to:
	05.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	05.02 Define and describe malicious software and techniques to protect systems from its effects.
	05.03 Describe Denial of Service attacks and means to defend against them.
	05.04 Identify the risks and techniques of data loss and its prevention.
	05.05 Describe the principles and techniques of securing data storage and transmission.
	05.06 Identify current encryption and authentication standards.
	05.07 Implement security policies, including compliance and operational security.
	05.08 Enable access control, identity management and security logging.

	05.09 Manage client and network system security software and related updates.
	05.10 Describe the functions and characteristics of firewalls.
	05.11 Perform a ping sweep to identify network hosts.
	05.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	05.13 Describe the purpose and operation of network protocol analyzers.
	05.14 Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
06.0	Perform testing activities. The student will be able to:
	06.01 Develop test plan.
	06.02 Develop test data.
	06.03 Validate input(s).
	06.04 Perform test(s).
	06.05 Validate expected outcomes.
	06.06 Determine boundary test cases.
	06.07 Load-test the system.
	06.08 Revise program code as necessary.
	06.09 Document test results.
	06.10 Evaluate system performance.
07.0	Perform user-training activities. The student will be able to:
	07.01 Assist in development of user documentation.
	07.02 Assist in development of training plan.
	07.03 Demonstrate appropriate user training techniques.
08.0	Perform implementation activities. The student will be able to:
	08.01 Develop an implementation plan.
	08.02 Install system.
	08.03 Validate system.
	08.04 Troubleshoot methodologies.
	08.05 Document implementation.

09.0	Perform user-support activities. The student will be able to:
09.01	Demonstrate proficient use of productivity software (word processing, spreadsheets, databases, presentation) skills.
09.02	Demonstrate appropriate communication and interpersonal skills.
09.03	Determine the customer needs using system analysis strategies.
09.04	Listen to the customer and ask appropriate questions.
09.05	Persist when dealing with difficult customers maintaining a professional demeanor.
09.06	Provide suggested information technology solutions.
09.07	Research and understand specific corporate culture.
09.08	Use tact when dealing with customer and competitors.
09.09	Maintain professional work ethics and follow policies and procedures.
09.10	Respect customer work space/environment.
09.11	Set realistic expectations when establishing deadlines for customer solutions.
09.12	Communicate action plan including timelines.
09.13	Recognize the existence of internal/external customers and follow appropriate guidelines for each.
10.0	Perform evaluation activities. The student will be able to:
10.01	Review software development plans.
10.02	Assess validity and performance of software systems.
10.03	Identify improvements to software systems.
10.04	Assist in revisions and enhancements of software systems.
10.05	Assist in project evaluation.
10.06	Recommend improvements.
10.07	Provide feedback to management, users and peer groups.
11.0	Develop an algorithm that solves a problem. The student will be able to:
11.01	List the steps in problem solving.
11.02	Write pseudocode using sequential control structures.
11.03	Write pseudocode using selection control structures.
11.04	Write pseudocode using repetition control structures.

	11.05 Discuss the efficiency of an algorithm.
	11.06 Implement the algorithm.
12.0	Use development methodologies. The student will be able to:
	12.01 Define the Waterfall methodology.
	12.02 Define the Agile methodology.
	12.03 Compare and contrast Waterfall and Agile methodologies.
	12.04 Develop a simple application using the Waterfall methodology.
	12.05 Develop a simple application using the Agile methodology.
13.0	Demonstrate proficiency in the use of AI tools in software development. The student will be able to:
	13.01 List AI tools commonly used in the software development process.
	13.02 Explain the pros and cons of using AI tools for software development.
	13.03 Describe how AI tools can be used in each stage of the software development process.
	13.04 Explain how AI tools can enhance a software developer's creativity and problem-solving efficiency.
	13.05 Explain how AI tools can enhance the functionality of a finished program.
	13.06 Describe the ethical considerations of using AI tools for software development.
14.0	Demonstrate professionalism, employability, and workplace skills. The student will be able to:
	14.01 Produce professional business documents, including resumes, business letters, and memos.
	14.02 Prepare, outline, and deliver short oral presentations in professional settings.
	14.03 Utilize research skills to gather relevant information, data, and graphics for work-related tasks.
	14.04 Demonstrate appropriate communication and interpersonal skills when interacting with coworkers, customers, and supervisors.
	14.05 Understand and apply professional dress, demeanor, and behavior appropriate for specific corporate cultures.
	14.06 Maintain professional work ethics by following company policies, procedures, and legal regulations.
	14.07 Demonstrate accountability, responsibility, and self-motivation to complete work assignments.
	14.08 Manage conflict and interact with customers or colleagues in a professional manner, even in difficult situations.
	14.09 Demonstrate reliability by consistently meeting deadlines and maintaining a strong work ethic.
	14.10 Identify career opportunities and set realistic, achievable professional goals.
	14.11 Research emerging technologies and industry trends to stay informed about the job market.

14.12	Build and maintain a professional network, including seeking mentorship and advice from industry experts.
14.13	Utilize job search strategies, including resume writing, interview preparation, and personal branding.
14.14	Follow both oral and written instructions to successfully complete tasks and assignments.
14.15	Prioritize tasks, manage time effectively, and meet deadlines consistently.
14.16	Understand and apply workplace health, safety, and security protocols.
14.17	Adapt communication style and behavior to fit various organizational cultures and workplace environments.
14.18	Collaborate with others in a team-oriented environment, contributing positively to group work.
14.19	Research and identify job roles and career paths in the computer programming and software development fields.
14.20	Understand the skills and qualifications required for various positions in technology and prepare accordingly.
14.21	Set expectations for job search processes, including interviewing, salary negotiation, and understanding career growth opportunities.
14.22	Exhibit effective problem-solving skills and decision-making abilities in the workplace.
14.23	Show self-motivation, adaptability, and initiative when tackling work-related challenges.
14.24	Follow guidelines for effective time management and organizational strategies.
14.25	Take responsibility for one’s own professional development and seek opportunities for growth and learning.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030 (4) F.A.C. identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science degree and the Associate of Applied Science degree. In addition, Rule 6A-14.0303 FAC implements section 1007.25 Florida Statutes and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Artificial Intelligence Awareness (0511020113) – 9 credit hours
Software Developer (0511020200) – 33/36 credit hours
Software Development Specialist (0511020103) – 18 credit hours
Internet of Things Applications (0511020110) – 24 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Database Technology**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511080200
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as Database Administrators and Developers Analysts in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

This program focuses on specific, transferable skills and stresses understanding and demonstration of the following elements of the database management and development industry: database creation, database management, database tuning, database software development, and database recovery.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related AS and AAS degrees.

- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of fundamental database concepts.
02.0 Demonstrate conceptual design principles.
03.0 Demonstrate the ability to create a database design.
04.0 Demonstrate an understanding of basic Data Definition Language and Data Manipulation Language SQL (Structured Query Language) syntax to create relational tables.
05.0 Demonstrate the ability to create, maintain, and delete sequences, indexes and synonyms and other schema objects.
06.0 Demonstrate the ability to query the database and optimize information retrieval.

In addition, students will complete the standards in one of the following specializations:

Microsoft Certified Database Administrator Specialization

07.0 Demonstrate how to design and implement a data warehouse.
08.0 Demonstrate how to extract and transform data.
09.0 Demonstrate how to load data.

Oracle Certified Database Administrator Specialization

10.0 Demonstrate how to create a database instance.
11.0 Demonstrate how to manage an instance of the database.
12.0 Demonstrate how to maintain Redo log files, and how to use the data dictionary views.
13.0 Demonstrate how to manage tablespaces and datafiles.
14.0 Demonstrate an understanding of database storage structures.
15.0 Demonstrate the ability to query a database.
16.0 Demonstrate how to manage constraints and indexes.
17.0 Demonstrate the ability to perform backups and recovery procedures.
18.0 Demonstrate an understanding of the goals and processes of performance tuning.
19.0 Demonstrate how to automate management tasks, create scheduled jobs, programs, and schedules.
20.0 Demonstrate the ability to efficiently manage space-related inefficiencies of the database.
21.0 Demonstrate the ability to understand a database memory management.
22.0 Demonstrate the ability to set up a database to be deployed globally.

Oracle Certified Database Developer Specialization

23.0 Demonstrate the use of general SQL programming language fundamental constructs.
24.0 Demonstrate the use of DML simple selection statements in a SQL block.
25.0 Demonstrate the use of conditional control IF and CASE statements.
26.0 Demonstrate the use of employing iterative control loops for iterating through a set of instructions.
27.0 Demonstrate the use of incorporating exception handling methods.
28.0 Demonstrate how to design and implement functions and procedures.

Florida Department of Education
Student Performance Standards

Program Title: **Database Technology**
CIP Number: **1511080200**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of fundamental database concepts. The student will be able to:
01.01	Define data.
01.02	Define information.
01.03	Describe the process by which information is derived from data.
01.04	Describe how a database is implemented.
01.05	Distinguish between variant database models, how they differ, and the advantages to each model.
01.06	Describe the advantages (i.e., improved data consistency, quality, integrity) and disadvantages of using databases (i.e., cost and complexity).
01.07	Conducting online research to locate and identify the different database engines, models, and providers.
01.08	Define and providing examples of a database transaction.
02.0	Demonstrate conceptual design principles. The student will be able to:
02.01	Perform a use case analysis and determining the functional requirements from use case.
02.02	Identify non-functional requirements that will affect a solution's design.
02.03	Analyze data requirements to determine data entities and attributes.
02.04	Analyze entities and attributes to determine their relationships.
02.05	Develop a conceptual model that captures the data flow and integrity constraints by using various components including:
•	Base entity type.
•	Bridging entity types.
•	Composite attribute.
•	Multivalued attribute.
•	Derived attribute.
•	Associative entity type.

	• Relationships between entity types.
	• Minimum and maximum cardinality constraints.
	• Deletion rules.
03.0	Demonstrate the ability to create a database design. The student will be able to:
03.01	Describe all data types (e.g., CHAR, NUMBER).
03.02	Discuss the basic tenets of proper database design by describing the impact of:
	• Data duplication.
	• Data redundancy.
	• Data integrity.
	• Implicit information storage.
	• Referential integrity.
03.03	Derive candidate keys by decomposition and synthesis.
03.04	Describe and executing the general methods of design using 3NF (third-normal form) to eliminate redundancy, partial and transitive dependencies.
03.05	Identify the primary key foreign key relationships between the entity types.
04.0	Demonstrate an understanding of basic Data Definition Language and Data Manipulation Language SQL (Structured Query Language) syntax to create relational tables. The student will be able to:
04.01	Describe the basic characteristics of the Standard Query Language.
04.02	Write SQL statements to create simple tables.
04.03	Create data integrity controls.
04.04	Change/update table definitions.
04.05	Insert, update, and delete data/records.
04.06	Describe referential integrity and how it is enforced.
04.07	Describe the advantages of using an index, and implementing different types of indexes on tables.
04.08	Describe how a database implements and uses indexing (i.e., B-Tree, Bitmap).
04.09	Verify the existence of an index using the data dictionary.
04.10	Describe foreign keys and their use when relating tables.
04.11	Define the purpose of a sequence and how it can be used in a database.
04.12	Create and removing a sequence.

05.0	Demonstrate the ability to create, maintain, and delete sequences, indexes and synonyms and other schema objects. The student will be able to:
05.01	Define the purpose of a sequence and how it can be used in a database.
05.02	Create and removing a sequence.
05.03	Create indexes and removing indexes.
05.04	Verify the existence of an index using the data dictionary.
06.0	Demonstrate the ability to query the database and optimize information retrieval. The student will be able to:
06.01	Identify the data elements by which to relate tables.
06.02	Retrieve row and column data from tables executing simple SELECT statements.
06.03	Identify keywords, mandatory clauses, and optional clauses in a SELECT statement.
06.04	Use character, number, and date functions in SELECT statements.
06.05	Create a search condition using mathematical comparison operators.
06.06	Use the WHERE clause to restrict the rows returned by a query.
06.07	Sort rows that are retrieved by a query, and use ampersand substitution to restrict and sort output at runtime.
06.08	Write SELECT statements to access data from more than one table using equijoins and non-equijoins.
06.09	Join a table to itself using a self-join.
06.10	View data that does not meet a join condition by using outer joins.
06.11	Generate a Cartesian product of all rows from two or more tables.
06.12	Identify the available group functions (GROUP BY, HAVING, INTERSECT).
06.13	Describe the use of the group functions.
06.14	Group data by using the GROUP BY clause.
06.15	Include or exclude grouped rows by using the HAVING clause.
06.16	Write complex SELECT statements including the use of various JOIN, SUBQUERIES, and conditional expressions.
06.17	Discuss when it is appropriate to use a subquery, and describing the types of problems that subqueries can solve.
06.18	Identify which clauses can contain subqueries.
06.19	Write single-row and multiple-row subqueries.
06.20	Nest a subquery inside another subquery.

Microsoft Certified Database Administrator Specialization	
07.0	Demonstrate how to design and implement a data warehouse. The student will be able to:
	07.01 Design and implement dimensions.
	07.02 Design and implement fact tables.
08.0	Demonstrate how to extract and transform data. The student will be able to:
	08.01 Define connection managers.
	08.02 Design data flow.
	08.03 Implement data flow.
09.0	Demonstrate how to load data. The student will be able to:
	09.01 Design control flow.
	09.02 Implement control flow.
	09.03 Implement data load options.
Oracle Certified Database Administrator Specialization	
10.0	Demonstrate how to create a database instance. The student will be able to:
	10.01 Explain the steps needed to create a database.
	10.02 Identify the database administrative tools.
	10.03 Configure the initial settings for creating the database.
	10.04 Create, start, and stop a database instance.
11.0	Demonstrate how to manage an instance of the database. The student will be able to:
	11.01 Create, manage, and use the initialization files.
	11.02 Identify the various states of starting an instance.
	11.03 Identify the various options available to shutdown an instance.
12.0	Demonstrate how to maintain log files, and how to use the data dictionary views. The student will be able to:
	12.01 Explain how the data files, log files, and archive files are linked and work together.
	12.02 Maintain and manage the log files.
	12.03 Obtain and archive log file information.
	12.04 Identify the use and contents of the data dictionary.

	12.05 Use the data dictionary to retrieve information about the database.
13.0	Demonstrate how to manage tablespaces and datafiles. The student will be able to:
	13.01 Describe the storage hierarchy.
	13.02 Differentiate between the logical and physical structures.
	13.03 Create many types of tablespaces.
	13.04 Configure and viewing storage for tablespaces and datafiles.
	13.05 Use and managing undo data.
	13.06 Describe and configuring diagnostic (trace) files.
14.0	Demonstrate an understanding of database storage structures. The student will be able to:
	14.01 Describe and differentiating between the logical and physical structure of the database.
	14.02 List the segment types and their uses.
	14.03 Maintain storage structures with automatic segment – space management.
	14.04 Maintain storage structures manually.
	14.05 Obtain storage structure information.
15.0	Demonstrate the ability to query a database. The student will be able to:
	15.01 Write basic SQL single row, datatype conversion, group, and user-defined functions.
	15.02 Write filtered, sorted, and aggregated queries.
	15.03 Write SQL statements using advanced queries involving joins, subqueries, and other specialized queries.
16.0	Demonstrate how to manage constraints and indexes. The student will be able to:
	16.01 List the different types of indexes, their uses, and constraints.
	16.02 Develop an example of each type of index.
	16.03 Create index-organized tables.
	16.04 Create, modify, and drop constraints.
	16.05 Maintain indexes.
	16.06 Identify unused indexes.
17.0	Demonstrate the ability to perform backup and recovery procedures. The student will be able to:
	17.01 Describe the various types of backups.

	17.02 Explain the different backup options available to the database professional.
	17.03 Perform a backup.
	17.04 Identify the different types of failures that occur in the database.
	17.05 Perform a complete recovery on a database.
	17.06 Perform an incomplete recovery on a database.
	17.07 Demonstrate how to perform a recovery of non-critical files.
18.0	Demonstrate an understanding of the goals and processes of performance tuning. The student will be able to:
	18.01 Describe the job roles in performance tuning.
	18.02 List the steps in the tuning phases.
	18.03 Explain tuning goals and service level agreements.
	18.04 Describe common performance problems.
	18.05 Explain the tuning methodology.
19.0	Demonstrate how to automate management tasks, use diagnostic tools, create scheduled jobs, programs, and schedules. The student will be able to:
	19.01 Use database utilities to create jobs, programs, and schedule tasks.
	19.02 Describe the purpose and use of the diagnostic tools that are available within the database.
	19.03 Use database utilities to view information about job executions and job instances.
	19.04 Use database utilities to perform automatic gathering of optimizer statistics.
	19.05 Use database utilities to automatically gather object statistics to make efficient decisions about execution plans.
20.0	Demonstrate the ability to efficiently manage space-related inefficiencies of the database. The student will be able to:
	20.01 Tune redo writing and archiving operations.
	20.02 Set and modifying thresholds for space usage.
	20.03 Manage tablespace usage to reduce space-related error conditions.
	20.04 Use different storage options to improve the performance of queries.
21.0	Demonstrate the ability to understand database memory management. The student will be able to:
	21.01 Explain the memory structures.
	21.02 Configure memory structures for database efficiency.
22.0	Demonstrate the ability to set up a database to be deployed globally. The student will be able to:

	22.01 Customize language-dependent behavior for the database and individual sessions.
	22.02 Specify different linguistic sorts for queries.
	22.03 Use date-time data types for different time zones.
	22.04 Query data using case-sensitive and accent-insensitive searches.
	22.05 Obtain globalization support configuration information.
Oracle Certified Database Developer Specialization	
23.0	Demonstrate the use of general SQL programming language fundamental constructs. The student will be able to:
	23.01 Employ SQL language components including variables and identifiers.
	23.02 Make use of data types.
	23.03 Explain the use of a block, nested block, and labels.
24.0	Demonstrate the use of DML simple selection statements in a SQL block. The student will be able to:
	24.01 Use the SELECT INTO syntax for variable initialization.
	24.02 Use Data Manipulation Language statements in a SQL block.
	24.03 Make use of a sequence in a SQL block.
	24.04 Make use of the COMMIT, ROLLBACK, and SAVEPOINT commands in a SQL block.
25.0	Demonstrate the use of conditional control IF and CASE statement. The student will be able to:
	25.01 Use the IF-THEN, and IF-THEN-ELSE control statements.
	25.02 Use nested IF statements.
	25.03 Use the CASE statement in a procedural block of code.
	25.04 Use a CASE expression.
26.0	Demonstrate the use of employing iterative control loops for iterating through a set of instructions. The student will be able to:
	26.01 Use simple loops with EXIT conditions.
	26.02 Use simple loops with EXIT WHEN conditions.
	26.03 Use WHILE loops.
	26.04 Use numeric FOR loops with the IN and REVERSE option.
27.0	Demonstrate the use of incorporating exception handling methods. The student will be able to:
	27.01 Explain the use of error handling methods.

	27.02 Use built-in exception handling mechanisms.
	27.03 Create user-defined exceptions.
28.0	Demonstrate how to design and implement functions and procedures. The student will be able to:
	28.01 Create procedures.
	28.02 Query the data dictionary for information on procedures.
	28.03 Use IN and OUT parameters with procedures.
	28.04 Create stored functions.
	28.05 Invoke functions with SQL statements.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030 (4) F.A.C. identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science degree and the Associate of Applied Science degree. In addition, Rule 6A-14.0303 FAC implements section 1007.25 Florida Statutes and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Microsoft Certified Database Administrator Certificate (0511020309) – 15 credit hours
Oracle Certified Database Administrator (0511020307) – 15 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Cloud Computing Technology**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511090200
Program Type	College Credit
Program Length	60 credit hours
CTSO	N/A
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to assessing cloud computing technology solutions for effective implementation, applying appropriate cloud services for organizational needs, determining network structure necessary for designated cloud solutions, and maintaining cloud solutions for consistent, reliable operation.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:

- Related CCC and ATD credentials.
- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Describe cloud computing architectures.
02.0 Describe cloud compliance and governance requirements.
03.0 Create strategies for disaster recovery and business continuity planning.
04.0 Implement cloud security practices.
05.0 Design virtual networks.
06.0 Create a plan for a cloud migration.

Florida Department of Education
Student Performance Standards

Program Title: **Cloud Computing Technology**
CIP Number: **1511090200**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Describe cloud computing architectures. The student will be able to:
01.01	Describe deployment models such as public, private, hybrid, and multi-cloud.
01.02	Describe service models such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).
01.03	Identify appropriate cloud services.
01.04	Explain the differences among the following architecture layers: hardware, virtualization and application and service.
01.05	Describe the differences between frontend and backend platforms.
02.0	Describe cloud compliance and governance requirements. The student will be able to:
02.01	Explain how organizational goals must be guided by applicable laws, regulations and contracts.
02.02	Explain the function and importance of asset management, financial controls, ownership, and cloud strategy and architecture.
02.03	Explain the function and importance of common regulatory standards and requirements such as HIPAA, PCI DSS, GDPR, ISO 27000 and GLBA.
02.04	Explain the role and importance of reporting and audits.
03.0	Create strategies for disaster recovery and business continuity planning. The student will be able to:
03.01	Explain the roles and components of assessment, preparedness, response and recovery.
03.02	Determine critical applications, documents, and resources.
03.03	Incorporate redundancy using concepts such as zones and/or regions.
03.04	Design recovery time objectives (RTOs) and recovery point objectives (RPOs).
03.05	List and describe the components of Disaster Recovery as a Service (DRaaS).
03.06	Explain the shared responsibilities between cloud provider and customer.
04.0	Implement cloud security practices. The student will be able to:
04.01	Utilize Identity and Access Management (IAM) including password policies, multi-factor authentication (MFA), and role-based access control (RBAC) to control and manage user access.
04.02	Implement network security measures including firewalls, VPNs, intrusion detection and prevention systems (IDPS), and network

		segmentation.
	04.03	Incorporate data encryption for data in transit and at rest.
	04.04	Institute threat detection and incident response procedures including monitoring Security Information and Event Management (SIEM) and log analysis.
	04.05	Create auditing and assessment guidelines.
05.0	Design virtual networks. The student will be able to:	
	05.01	Create subnets.
	05.02	Implement network segmentation.
	05.03	Implement routing.
	05.04	Establish security zones such as DMZ (demilitarized zones), internal networks and external networks.
	05.05	Implement load balancing.
06.0	Create a plan for a cloud migration. The student will be able to:	
	06.01	Assess current infrastructure and applications.
	06.02	Define migration goals and requirements.
	06.03	Design a data migration strategy.
	06.04	Design infrastructure and network setup requirements.
	06.05	List and describe the components of testing and validation.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication
- Humanities
- Mathematics
- Natural Sciences
- Social Sciences

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Systems Technology**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511100112
Program Type	College Credit
Program Length	60 credit hours
CTSO	FBLA-PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as cabling specialists, network control operators, data communications analysts, network technicians, computer security specialists, network specialists, network managers, network systems analysts, network systems technicians, network troubleshooters, WAN/LAN managers, or systems administrators in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to planning, installing, configuring, monitoring, troubleshooting, and managing computer networks in a LAN/WAN environment. Students will be prepared to apply conceptual, theoretical and practical knowledge to the workplace utilizing technical skills learned during the program.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of core standards and eight different tracts to permit students to specialize in network administration, network infrastructure, network virtualization, network security/cybersecurity, IP communications, digital forensics, advanced network

infrastructure. Or Linux system administrator. Standards comprising each specialization area are completed in addition to the core standards. Due to the foundational nature of the core, it is recommended that students complete the core, or demonstrate a mastery of the student performance standards contained in the core, before advancing to courses comprising a specialization tract. Standards in the core prepare students with requisite foundational knowledge and skills related to computer maintenance and support, networking fundamentals, operating systems, network security, technical communications, and project management. The total Associate in Science degree program consists of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

In addition, students will complete the standards in one of the following specializations:

Specialization Track	Page
Network Administration	11
Network Infrastructure	16
Network Security/Cybersecurity	21
Network Virtualization	22
Digital Forensics	25
IP Communications	30
Advanced Network Infrastructure	33
Linux System Administrator	39

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency in basic computer maintenance and support.
02.0 Explain and apply fundamental concepts of computer networking.
03.0 Describe common operating systems deployments and associated practices.
04.0 Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards.
05.0 Explain technical and verbal communication and protocols in a technical environment.
06.0 Implement basic project management concepts and processes.
07.0 Demonstrate workplace-readiness skills.
08.0 Employ tools to improve efficiency in solving business problems using a current industry-standard computer programming language.

In addition, students will complete the standards in one of the following specializations:

Network Administration Specialization
09.0 Demonstrate knowledge of the directory services infrastructure and installation.
10.0 Demonstrate an understanding of organizational units and related objects.
11.0 Demonstrate an understanding of group policy.
12.0 Demonstrate an understanding of implementing sites to manage Active Directory replication.
13.0 Demonstrate an understanding of maintaining Active Directory services availability.
14.0 Install and deploy a server operating system.
15.0 Demonstrate provision of infrastructure services.
16.0 Demonstrate how to provide file and print services.
17.0 Demonstrate how to provide remote and wireless network access.
18.0 Demonstrate how to monitor and maintain network servers and services.
19.0 Implement secure data transmission and authentication.
20.0 Explain the process of planning for business continuity and high availability.

Network Infrastructure Specialization
21.0 Describe routing concepts.
22.0 Demonstrate understanding of routing protocols.
23.0 Demonstrate router configuration skills.
24.0 Explain LAN design and concepts.
25.0 Demonstrate VLAN configuration skills.
26.0 Describe WAN Protocols and technologies.
27.0 Demonstrate WAN configuration skills.
28.0 Demonstrate an understanding of network security.
29.0 Describe remote access options.
30.0 Describe and implement IP addressing services.

31.0 Demonstrate an understanding of network maintenance, support and troubleshooting.

Network Security/Cybersecurity Specialization

32.0 Identify key principles of network security and data protection.
33.0 Conduct a Red, Purple, or Blue team activity and compile a list of recommendations.
34.0 Explain cybersecurity threats and mitigation strategies.
35.0 Implement security configurations and encryption techniques to protect network infrastructures.
36.0 Develop and refine incident response plans based on real-world security scenarios.
37.0 Describe the basic function/s of a Security Information and Event Management (SIEM), Security Orchestration, Automation and Response (SOAR), and Artificial Intelligence (AI) in the area of Cyber Security.

Network Virtualization Specialization

38.0 Install and configure the virtualization platform.
39.0 Define core virtualization concepts, including cloud and hybrid models.
40.0 Evaluate and explain performance metrics and optimization in virtual environments.
41.0 Diagnose and mitigate security vulnerabilities within virtualization infrastructure.
42.0 Engineer scalable and secure virtualization solutions tailored to enterprise needs.

Digital Forensics Specialization

43.0 Demonstrate proficiency in the basic foundations of advanced security concepts
44.0 Exhibit proficiency in managing hardware involved in imaging and data collection activities.
45.0 Illustrate competence in analyzing common file systems.
46.0 Apply knowledge in performing computer forensics investigations.
47.0 Apply knowledge in performing mobile device forensics.
48.0 Create and implement incident handling and response processes.
49.0 Identify key pieces of legislation and processes related to digital forensics.
50.0 Define the tasks related to the casework process.

IP Communications Specialization

51.0 Demonstrate an understanding of IP communications.
52.0 Explain digitizing voice traffic and voice compression standards.
53.0 Identify and explain Quality of Service (QoS) requirements in a converged data and voice network.
54.0 Explain the types of IP communications design options.
55.0 Demonstrate proficiency in troubleshooting IP communications.
56.0 Explain deployment of advanced Voice over IP (VoIP) and data bundle solutions to provide a single network connection for phone services and high-speed Internet.
57.0 Illustrate knowledge of using Statistical Analysis System (SAS) sessions to exchange data by using the TCP/IP communications access method.
58.0 Identify key concepts for Video over IP.

Advanced Network Infrastructure Specialization

59.0 Explain basic routing concepts.
60.0 Explain operation of routing protocols.
61.0 Demonstrate router configuration skills.
62.0 Explain LAN design and concepts.
63.0 Demonstrate VLAN configuration skills.
64.0 Demonstrate an understanding of network maintenance, support and troubleshooting.

Linux System Administrator Specialization

65.0 Demonstrate ability to use essential tools.
66.0 Demonstrate ability to run operating systems.
67.0 Configure local storage.
68.0 Create and configure file systems.
69.0 Demonstrate skills to deploy, configure, and maintain systems.
70.0 Manage users and groups.
71.0 Manage security.

Employability Skills

72.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Network Systems Technology**
CIP Number: **1511100112**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in basic computer maintenance and support. The student will be able to:
01.01	Describe the main computer components and their functions.
01.02	Describe the operation of computer systems, including input and output systems, file systems, device management, program loading, execution and data storage.
01.03	Explain and demonstrate the safe and ethical use of computers.
01.04	Describe and identify proficiency in connecting to and safely using the Internet.
01.05	Describe emerging computer technologies and discuss their potential impact.
01.06	Implement proper procedures for handling and safeguarding equipment.
01.07	Describe procedures for proper disposal of computer components.
01.08	Install, configure, maintain and secure computer systems and peripherals following institutional protocol.
01.09	Explain the procedures for updating firmware and ROM-BIOS on PCs and Laptops.
01.10	Implement work order procedures.
01.11	Design and implement systems redundancy and data backups.
01.12	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
01.13	List the steps in problem solving.
01.14	Recognize and resolve basic computer configuration problems.
01.15	Identify and summarize 5 major Hive Keys of the Windows Registry.
02.0	Explain and apply fundamental concepts of computer networking. The student will be able to:
02.01	Explain the use of binary numbers and perform related binary and hexadecimal arithmetic.
02.02	Describe current network environments.
02.03	Describe network communications and architecture.
02.04	Identify network components, media, connectors, applications and protocols.

	02.05	Compare and contrast the OSI and TCP/IP reference models and explain their top / down encapsulation process.
	02.06	Identify and describe current relevant IEEE network standards.
	02.07	Explain a class 'C' network using a classful and classless routing scheme.
	02.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
	02.09	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
	02.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
	02.11	Describe the major functions of LAN protocols.
	02.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
	02.13	Configure and explain the TCP/IP protocol stack.
	02.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
	02.15	Identify emerging technologies and discuss related technical issues.
	02.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
	02.17	State the functionality and purpose of Virtual Local Area Networks (VLANS).
	02.18	Identify and explain wide area network (WAN) concepts.
	02.19	Plan, configure and test a small network and establish baselines.
	02.20	Describe the major functions of network server software components.
	02.21	Install applications on a server and configure clients for network access.
03.0	Describe common operating systems deployments and associated practices. The student will be able to:	
	03.01	Compare and describe the components and functions of major operating systems.
	03.02	Explain the functions, features and differences of Active Directory and Directory Services.
	03.03	Install, configure and update client and server operating systems.
	03.04	Describe the purpose and uses of computer virtualization.
	03.05	Manage device drivers and software for peripheral devices.
	03.06	Manage the network and firewall settings of a client.
	03.07	Use an operating system for activities such as data and file management.
	03.08	Identify current systems utilities and describe their functions.
	03.09	Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.

	03.10 Create, use, maintain, backup and restore system configuration files.
	03.11 Restate the correct procedure/s for uninstalling operating system software.
	03.12 Install and configure client software for connecting to LANs, WANs, and the Internet.
	03.13 Demonstrate knowledge of basic troubleshooting methodology.
04.0	Apply fundamental network security practices to identify vulnerabilities and implement basic safeguards. The student will be able to:
	04.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	04.02 Define and describe malicious software and techniques to protect systems from its effects.
	04.03 Explain the difference between an on-path attack vs an on-network attack, and how to mitigate them both.
	04.04 Explain the use of the 5x5 risk matrix tool and where it is commonly used.
	04.05 Describe the principles and techniques of securing data storage and transmission.
	04.06 Explain the current encryption and authentication standards.
	04.07 Describe security policies, including compliance and operational security.
	04.08 Configure access control, identity management and security logging.
	04.09 Describe client and network system security software and related updates.
	04.10 Explain the differences between software and hardware firewalls and where they are used.
	04.11 Demonstrate the use of Command Line Interface (CLI) troubleshooting tools.
	04.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	04.13 Describe the purpose and operation of network protocol analyzers.
	04.14 Demonstrate the network use of Wireshark; Nmap, and evaluate Nmap results.
	04.15 Demonstrate critical thinking skills during network and security troubleshooting.
05.0	Explain technical and verbal communication and protocols in a technical environment. The student will be able to:
	05.01 Identify issues in the communication of technical information to a non-technical audience.
	05.02 Create, utilize, and maintain system documentation.
	05.03 Utilize online resources to locate and evaluate technical information and documentation.
	05.04 Identify and discuss issues contained within professional codes of conduct.
	05.05 Create and explain a technical presentation to a non-technical audience.
	05.06 Create and interpret technical and business communications.

	05.07	Demonstrate the basic principles of teamwork and the techniques for being a productive and effective contributing member of a team.
	05.08	Identify and describe acceptable strategies for resolving conflicts in the workplace.
	05.09	Deliver and follow oral and written technical instructions.
	05.10	Explain the roles of helpdesk administrator, server administrator, network administrator, and cyber security analyst in the workplace.
	05.11	Document problems and solutions in service reports and maintain proper documentation.
	05.12	Perform research on technical issues using Internet and database resources.
06.0	Implement project management concepts and processes. The student will be able to:	
	06.01	Examine the organization, planning, and controlling of projects.
	06.02	Explain the key differences between Business and IT Project Management.
	06.03	Describe project phases, process groups, and the full project life cycle.
	06.04	Choose appropriate actions in situations that require effective time management. Understand the basic tools and techniques to plan, organize, and manage a project.
	06.05	Describe a project life cycle from initiation to planning through execution, acceptance, support, quality, budgeting, and closure.
	06.06	Explain the factors contributing to risk management planning.
	06.07	Explain the project environment including cultural, social, international, political and physical.
	06.08	Describe the principles of identifying, developing, and managing resources.
	06.09	Plan and monitor a project budget and schedule using project management tools.
	06.10	Explain the technical and human aspects of project control, especially change control.
	06.11	Describe the basic tools and techniques of managing project quality and risk.
	06.12	Explain the contextual relationship between the project and the organization that hosts the project.
	06.13	Demonstrate an understanding of the importance of working in teams, managing team members, and interacting with stakeholders.
	06.14	Explain the importance of ethical considerations in every aspect of a project's operation.
07.0	Demonstrate workplace-readiness skills. The student will be able to:	
	07.01	Explain the value of proper communication in the classroom and workplace environment.
	07.02	Participate in group discussions as a member and as a leader.
	07.03	Explain the importance of self-motivation and responsibility in completing assigned tasks.
	07.04	Choose appropriate actions in situations requiring effective time management.
	07.05	Apply principles and techniques for being a productive, contributing member of a team.

	07.06 Discuss the ethical aspects of intellectual property rights and licensing issues.
	07.07 Identify and discuss issues contained within professional codes of conduct.
	07.08 Describe appropriate communication skills, courtesy, manners, and dress in the workplace.
08.0	Employ tools to improve efficiency in solving business problems using a current industry-standard computer programming language. The student will be able to.
	08.01 Use an industry-standard programming language to write code that solves common business problems.
	08.02 Apply integrated development tools (such as debuggers, code editors, and automation features) to improve programming efficiency.
	08.03 Develop programs that automate routine business tasks to enhance productivity and accuracy.
	08.04 Implement appropriate data structures and libraries to manage and process business-related data effectively.
	08.05 Test, debug, and refine program solutions to ensure they meet defined business requirements and operate efficiently.
Network Administration Specialization	
09.0	Demonstrate knowledge of the directory services infrastructure and installation. The student will be able to:
	09.01 Describe the architecture of Active Directory.
	09.02 Discuss how Active Directory works.
	09.03 Describe the Active Directory design, plan, and implementation processes.
	09.04 Create a forest and domain structure.
	09.05 Configure the Domain Name Service (DNS) in an Active Directory environment.
	09.06 Raise the functional level of a forest and a domain.
	09.07 Create trust relationships between domains.
	09.08 Create, manage, and delegate administrative control for organizational units.
10.0	Demonstrate an understanding of organizational units and related objects. The student will be able to:
	10.01 Discuss user, group, and computer accounts.
	10.02 Create and manage multiple accounts.
	10.03 Implement user principal name suffixes.
	10.04 Move objects in Active Directory.
	10.05 Plan an account strategy.
	10.06 Plan an Active Directory audit strategy.
11.0	Demonstrate an understanding of group policy. The student will be able to:

	11.01 Create and configure group policy objects (GPOs).
	11.02 Configure group policy refresh rates and group policy settings.
	11.03 Manage GPOs.
	11.04 Verify and troubleshoot group policy.
	11.05 Delegate administrative control of group policy.
	11.06 Plan a group policy strategy for the enterprise.
	11.07 Configure, deploy and maintain applications using group policy.
	11.08 Monitor and maintain security policies.
	11.09 Prepare and implement group policy strategy and backup/recovery of group policy objects.
12.0	Demonstrate an understanding of implementing sites to manage Active Directory replication. The student will be able to:
	12.01 Discuss directory services replication.
	12.02 Design and document site topology.
	12.03 Manage site topology.
	12.04 Troubleshoot replication failures.
	12.05 Plan, create and configure a site.
	12.06 Implement the global catalog in Active Directory.
	12.07 Plan and determine the placement and type of domain controllers in Active Directory.
	12.08 Identify the various Operations Master Roles and Global Catalog.
	12.09 Plan the placement of Operations Masters and Global Catalog.
	12.10 Transfer and seize Operations Master Roles.
13.0	Demonstrate an understanding of maintaining Active Directory services availability. The student will be able to:
	13.01 Create an Active Directory implementation plan for a business enterprise.
	13.02 Implement the Active Directory infrastructure for a business enterprise.
	13.03 Describe the maintenance of the Active Directory.
	13.04 Move and defragment an Active Directory database.
	13.05 Backup and restore an Active Directory.
	13.06 Monitor an Active Directory.

14.0	Install and deploy a server operating system. The student will be able to:
	14.01 Identify server operating system (OS) versions, editions, features and capabilities.
	14.02 Assess server installation readiness by inventorying hardware.
	14.03 Describe the methods, options and requirements for a Windows server installation and upgrade.
	14.04 Perform an attended and an unattended OS installation.
	14.05 Configure basic network settings.
	14.06 Configure storage.
	14.07 Configure operating systems licensing.
	14.08 Describe, identify and choose server roles and role services.
	14.09 Perform a system review and troubleshoot installation issues.
	14.10 Discuss the system installation.
	14.11 Automate server deployments using unattended installation tools and Windows.
	14.12 Implement deployment services.
15.0	Demonstrate provision of infrastructure services. The student will be able to:
	15.01 Describe the purpose and function of Dynamic Host Configuration Protocol (DHCP).
	15.02 Install, configure, and authorize the DHCP server role.
	15.03 Manage, backup and restore the DHCP Database.
	15.04 Configure the DHCP Relay Agent.
	15.05 Describe the DNS name resolution process.
	15.06 Configure DNS zones, records and replication.
	15.07 Integrate DNS servers with Active Directory.
	15.08 Configure name resolution for client computers.
16.0	Demonstrate how to provide file and print services. The student will be able to:
	16.01 Design a file sharing strategy.
	16.02 Install the file and print server roles and services.
	16.03 Manage file sharing security, encryption, redundancy, and offline access.
	16.04 Manage disk quotas, file screening and shadow copy services.

	16.05 Backup and restore files.
	16.06 Configure Distributed File System (DFS) roots, targets and replication.
	16.07 Identify and install print drivers.
	16.08 Manage printer security, priorities, schedules and pools.
	16.09 Publish printers and file shares to Active Directory.
	16.10 Monitor and troubleshoot print and file services.
17.0	Demonstrate how to provide remote and wireless network access. The student will be able to:
	17.01 Compare and contrast remote access protocols, wireless standards and network authentication methods.
	17.02 Configure static and dynamic routing, Network Address Translation (NAT).
	17.03 Configure remote access services, protocols and policies, conditions and settings.
	17.04 Configure Remote Access Dial-In User Service (RADIUS).
	17.05 Configure wireless clients with Group Policy.
	17.06 Monitor and troubleshoot remote access and wireless connections.
18.0	Demonstrate how to monitor and maintain network servers and services. The student will be able to:
	18.01 Monitor and compare network and server performance data to establish and document baselines, isolate problems and optimize performance, adaptability, and scalability.
	18.02 Optimize traffic flow conditions on network connections based on analysis of traffic types, characteristics and user needs.
	18.03 Monitor event logs for information, errors and warnings.
	18.04 Maintain system documentation and service histories.
	18.05 Configure server and client settings to implement patch management strategy.
	18.06 Develop strategies for remote server management using command-line and GUI tools.
19.0	Implement secure data transmission and authentication. The student will be able to:
	19.01 Explain the social, ethical and technical issues regarding data integrity and confidentiality.
	19.02 Secure network traffic using IPSec.
	19.03 Configure network authentication.
	19.04 Install, configure and manage certificate services.
	19.05 Describe and deploy a Network Access Protection strategy.
	19.06 Configure firewall settings.

	19.07 Identify ports and protocols and create filters for incoming and outgoing traffic.
20.0	Explain the process of planning for business continuity and high availability. The student will be able to:
	20.01 Discuss virtualization architectures.
	20.02 Estimate data storage requirements.
	20.03 Select a storage technology.
	20.04 Plan for storage fault tolerance.
	20.05 Develop strategies to ensure application and service availability.
	20.06 Differentiate and apply static and dynamic routing.
Network Infrastructure Specialization	
21.0	Describe routing concepts. The student will be able to:
	21.01 Differentiate between routing and routable protocols
	21.02 Identify the hardware and software components of routers.
	21.03 Explain the purpose and nature of routing tables.
	21.04 Describe administrative distance and routing metrics such as hop counts and cost.
	21.05 Explain how a router determines a path and forwards or drops a packet.
	21.06 Differentiate between static and dynamic routing.
	21.07 Explain the differences between class-full and classless routing.
	21.08 Describe the use and operation of VLSM and CIDR.
	21.09 Describe how a network converges.
22.0	Demonstrate understanding of routing protocols. The student will be able to:
	22.01 Describe the characteristics of distance vector routing protocols.
	22.02 Describe the characteristics of link state routing protocols.
	22.03 Describe the differences between distance vector and link state routing protocols and determine the best routing protocol to use in a given situation.
	22.04 Describe the features and operation of current internal and external routing protocols.
23.0	Demonstrate router configuration skills. The student will be able to:
	23.01 Configure and verify router interfaces.
	23.02 Perform basic router configuration using the Command Line Interface (CLI) to inspect the operations of the router.

	23.03 Design and implement a classless IP addressing scheme for a network.
	23.04 Describe a router for RIP version 2 operation.
	23.05 Use advanced configuration commands with routers.
	23.06 Configure a router for OSPF routing in a network.
	23.07 Fine-tune OSPF settings on a router, including the configuration of reference bandwidth, redistribution of static and default routes, and modification of OSPF intervals, in order to optimize network performance.
	23.08 Verify and troubleshoot router operations in an OSPF network.
	23.09 Configure and modify metric on a router to improve network performance.
	23.10 Configure summarization and default route settings on a router to optimize network performance.
	23.11 Verify and troubleshoot router operations in complex network environment.
24.0	Explain LAN design and concepts. The student will be able to:
	24.01 Identify the layers and functions of switched network architecture.
	24.02 Describe the principles and benefits of a hierarchical network design.
	24.03 Explain the technology and media access control method for Ethernet networks.
	24.04 Describe the issues associated with Layer 2.
	24.05 Describe the operation of a LAN switch.
	24.06 Describe the benefits of Virtual Local Area Networks (VLAN).
	24.07 Identify and describe the different VLAN encapsulation protocols and their operation.
	24.08 Describe the purpose and operation of VLAN Trunking Protocol (VTP) in the management of a switched network domain.
	24.09 Describe the purpose and operation of Spanning Tree Protocol (STP), and its variants.
	24.10 Describe the use of Inter-VLAN routing to connect different Networks in a switch-based network topology.
	24.11 Analyze business requirements and design a LAN structure to meet those requirements.
	24.12 Discuss quality-of-service considerations and switching prioritization.
25.0	Demonstrate VLAN configuration skills. The student will be able to:
	25.01 Perform and verify initial LAN switch configuration tasks including remote access management, switch port modes, and trunks.
	25.02 Configure, verify, and troubleshoot VLANs on a LAN switch.
	25.03 Implement a VLAN Domain by configuring LAN switches for VTP network operation.
	25.04 Configure a router to provide Inter-VLAN routing using multiple physical interfaces, and on a single physical interface with sub-interfaces.

	25.05 Configure and troubleshoot STP and its variants on a switched network environment.
	25.06 Configure and verify the bridge to optimize STP.
	25.07 Establish and configure port priorities.
	25.08 Troubleshoot and resolve issues with STP operations.
	25.09 Manage router and switch IOS software.
26.0	Describe WAN Protocols and technologies. The student will be able to:
	26.01 Describe WAN and MAN topologies.
	26.02 Differentiate between WAN and LAN topologies.
	26.03 Identify and describe WAN protocols.
	26.04 Describe the impact of applications (Voice Over IP, Video Over IP) on a network.
	26.05 Identify major network issues associated with the Internet, intranets and extranets.
	26.06 Explain the differences between the use of leased lines, packet-switched, and circuit-switched technologies.
	26.07 Describe typical WAN links and discuss bandwidth considerations.
	26.08 Identify and manage licensing.
27.0	Demonstrate WAN configuration skills. The student will be able to:
	27.01 Configure and verify Point-to-Point WAN connection.
	27.02 Configure and verify a packet switched WAN connection.
	27.03 Configure and verify a basic WAN serial connection and a PPP connection between routers.
	27.04 Configure and verify a PPP connection between routers.
	27.05 Troubleshoot WAN implementation issue.
	27.06 Implement LAN/WAN connections, including virtual private networks (VPN), and tunneling.
28.0	Demonstrate an understanding of network security. The student will be able to:
	28.01 Implement basic switch security measures such as port security, trunk access, and management VLANs.
	28.02 Identify current network security threats and explaining how to implement a comprehensive security policy to mitigate common threats to network devices, hosts, and applications.
	28.03 Describe the functions of common security appliances and applications.
	28.04 Implement recommended security practices to secure network devices.
	28.05 Discuss the functions of authentication servers.

	28.06 Describe the function and use of Access Control Lists (ACLs).
	28.07 Verify, monitor, and troubleshoot ACLs in a network environment.
29.0	Describe remote access options. The student will be able to:
	29.01 Compare and contrast remote access protocols, wireless standards and network authentication methods.
	29.02 Configure static and dynamic routing and Network Address Translation (NAT).
	29.03 Configure remote access services, protocols and policies, conditions and settings.
	29.04 Implement Remote Access Dial-In User Service (RADIUS).
	29.05 Monitor and troubleshoot remote access.
30.0	Describe and implement IP addressing services. The student will be able to:
	30.01 Describe the purpose and operation of DHCP and DNS in a networked environment.
	30.02 Configure, verify, and troubleshoot DHCP and DNS operations on a router.
	30.03 Describe the operation and use of NAT and Port Address Translation (PAT) to provide Internet access to Private IP Address networks.
	30.04 Configure, verify, and troubleshoot NAT on a router, including static translation, use of IP Address pools, and sharing a public IP address on a router interface.
	30.05 Explain the abbreviating rules, purpose and operation of IPv6
	30.06 Configure, verify, and troubleshoot IPv4 and IPv6 routing in a network.
31.0	Demonstrate an understanding of network maintenance, support and troubleshooting. The student will be able to:
	31.01 Identify, interpret and maintain network documentation, procedures and practices.
	31.02 Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
	31.03 Follow standard operating procedures for troubleshooting hardware and software.
	31.04 Manage, maintain and backup router and switch system and configuration files.
	31.05 Recognize and resolve hardware and software configuration problems.
	31.06 Identify and explain resolution of common network problems found on layers 1 through 7 of the Open Systems Interconnection (OSI) model.
	31.07 Determine type of programs and procedures required to: baseline network performance, identify intrusion and unacceptable system use, identify performance issues, predict system failures, and optimize network availability.
	31.08 Inspect and evaluate malicious and suspicious activities via logs, Intrusion Detection Systems, software and appliances.
	31.09 Describe various attack vectors to a network and the threat mitigation techniques that protect those vectors.
	31.10 Explain how SIEM, SOAR, an AI is used in today's networks for automation and threat detection.

	31.11 Explain the basics of the MITRE ATT&CK framework, the Diamond Model, and the Cyber Kill Chain and how these intrusion analysis models are used.
	31.12 Describe how Security Onion is used to train security analysts and threat hunters.
	31.13 Identify and explain the function, main tasks, and goal of the RED, BLUE, PURPLE, and WHITE teams in cyber security.
Network Security/Cybersecurity Specialization	
32.0	Identify key principles of network security and data protection. The student will be able to:
	32.01 Explain the major categories of computer crimes and attacks.
	32.02 Identify vulnerabilities inherent in network devices, protocols and services.
	32.03 Develop institutional security policies and practices in compliance with relevant governmental standards and regulations.
	32.04 Implement protective measures in securing critical information assets.
	32.05 Deploy various network security related equipment including firewalls, intrusion prevention systems, and proxies.
	32.06 Secure critical network services such as Directory Services, Domain Name Service (DNS), Dynamic Host Configuration Protocol (DHCP), and File Transfer Protocol (FTP).
	32.07 Secure desktop client operating systems against viruses, malware and other malicious attacks.
	32.08 Detect malicious and abnormal activities through logs, intrusion detection systems and other utilities and appliances.
33.0	Conduct a Red, Purple, or Blue team activity and compile a list of recommendations. The student will be able to:
	33.01 Identify organizational compliance with regulatory and legislative Information Assurance (IA) requirements.
	33.02 Identify physical and logical weaknesses in computers and networks as well as physical weaknesses and weaknesses in policies, procedures and practices relating to the network and the organization.
	33.03 Test the network perimeter defense mechanisms to ensure boundaries.
	33.04 Simulate methods that intruders use to gain unauthorized access into an organization's networked systems with the intent to compromise them.
	33.05 Deploy proprietary and/or open-source tools to test known technical vulnerabilities in networked systems.
	33.06 Determine which vulnerabilities are exploitable and the degree of information exposure or network control that the organization could expect an attacker to achieve after successfully exploiting vulnerability.
	33.07 Recommend procedures to mitigate against discovered vulnerabilities and security gaps.
	33.08 Prepare penetration testing deliverables including reports, documentations.
	33.09 List four ethical requirements of Red, Purple, and Blue team members.
34.0	Explain cybersecurity threats and mitigation strategies. The student will be able to:
	34.01 Explain contingency planning and its components.

	34.02 Collect data from logs and other resources to aid in detecting security incidents.
	34.03 Assemble an incident response plan.
	34.04 Recover from incidents by restoring services and processes.
	34.05 Manage evidentiary data in an electronic environment.
35.0	Implement security configurations and encryption techniques to protect network infrastructures. The student will be able to:
	35.01 Configure firewall rules and access control list statements. vera
	35.02 Configure Network Segmentation.
	35.03 Configure Router and Switch security.
	35.04 Explain 5 common encryption techniques used in the industry.
	35.05 Explain Symmetric vs. Asymmetric encryption.
	35.06 Describe 4 other security models and their purpose.
36.0	Develop and refine incident response plans based on real-world security scenarios. The student will be able to:
	36.01 Explain what a Post-Mortem Analysis covers.
	36.02 Explain the steps in Refining and Updating Incident Response Plans (IRPs).
	36.03 Describe the function of a Playbook in Cybersecurity.
	36.04 Describe Realistic training and exercises.
	36.05 Create an Incident Response Plan for XYZ Credit Union.
	36.06 Define Initial Attack Vector, Business email compromise, and Insider Threat.
37.0	Describe the basic functions of Security Information and Event Management (SIEM), Security Orchestration, Automation and Response (SOAR), and Artificial Intelligence (AI) in the area of Cyber Security. The student will be able to:
	37.01 Describe 6 basic functions of a Security and Event Management (SIEM) system.
	37.02 Describe 5 basic functions of a Security Orchestration, Automation, and Response (SOAR) system.
	37.03 Describe a minimum of 4 basic functions of AI in Cybersecurity.
	37.04 Explain how the multi-layered process works in a Security Information and Event Management (SIEM) system.
	37.05 Create a table listing the differences between a SIEM, SIM, and SOAR.
	37.06 Create a table listing the Primary purpose, Scope of Data, and Deployment model for Endpoint Detection and Response (EDR), Extended Detection and Response (XDR), and Managed Detection and Response (MDR).
Network Virtualization Specialization	
38.0	Install and configure the virtualization platform. The student will be able to:

	38.01 Install and configure the virtualization platform.
	38.02 Install and configure the virtualization environment to create a new farm or join an existing farm.
	38.03 Automate virtual machine and cluster deployment.
	38.04 Monitor and maintain license usage requirements and trends.
	38.05 Manage virtualization networking and storage.
	38.06 Manage user sessions from the administrative console.
	38.07 Configure network connectivity and storage for the virtualization software.
39.0	Define core virtualization concepts, including cloud and hybrid models. The student will be able to:
	39.01 Identify requirements for virtual machines according to task.
	39.02 Configure the virtual environment and the virtual machine properties.
	39.03 Install, configure and manage a virtual machine desktop client.
	39.04 Install, configure and manage a virtualized server.
	39.05 Manually deploy and migrate virtual machines.
	39.06 Configure and assign users to pooled virtual desktops and dedicated virtual desktops.
	39.07 Convert physical machines to virtual machines.
	39.08 Configure desktop resources for access by users.
	39.09 Configure and monitor back up virtual machine data to shared storage.
	39.10 Migrate, convert, and monitor virtual machines.
	39.11 Create and update shared disks.
40.0	Evaluate and explain performance metrics and optimization in virtual environments. The student will be able to:
	40.01 Manage user access to virtualized applications and machines in the virtualization infrastructure.
	40.02 Manage the infrastructure to provide high availability and data access.
	40.03 Describe administration of the virtualization environment.
	40.04 Describe tools that can be used to monitor virtualization application servers and sessions.
	40.05 Manage and maintain network infrastructure and storage resources.
	40.06 Create and apply worker groups.
	40.07 Configure and optimize load management.

	40.08 Configure a resource pool for optimal performance.
	40.09 Troubleshoot infrastructure problems and virtual environment issues.
	40.10 Resolve application compatibility issues.
41.0	Diagnose and mitigate security vulnerabilities within virtualization infrastructure. The student will be able to:
	41.01 Describe the securing and maintenance of a virtualization solution.
	41.02 Restrict and protect administrator access to the virtualization solution.
	41.03 Ensure that the hypervisor is properly secured.
	41.04 Create a plan for the security for a virtualization solution before installing, configuring and deploying it.
	41.05 Secure elements of a virtualization solution and maintain their security.
42.0	Engineer scalable and secure virtualization solutions tailored to enterprise needs. The student will be able to:
	42.01 Design and configure virtualized environments that meet defined enterprise performance, scalability, and resource-allocation requirements.
	42.02 Implement secure virtualization practices, including access controls, network segmentation, and hypervisor-level protections, to safeguard enterprise assets.
	42.03 Deploy and manage virtual machines, containers, and supporting infrastructure to ensure high availability and efficient workload distribution.
	42.04 Evaluate virtualization architectures and optimize them through monitoring, capacity planning, and performance tuning to support evolving enterprise needs.
Digital Forensics Specialization	
43.0	Demonstrate proficiency in the basic foundations of advanced security concepts. The student will be able to:
	43.01 Demonstrate knowledge of cybersecurity foundations, including its origins, trends, culture, and legal implications.
	43.02 Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, organizational).
	43.03 Describe the role of digital certificates and their role in IT security.
	43.04 Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
	43.05 Describe the use of firewalls and other means of intrusion prevention.
	43.06 Describe security design principles and their role in limiting points of vulnerability.
	43.07 Discuss authentication methods and strategies.
	43.08 Describe the processes involved in hardening a computer system or network.
	43.09 Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.

	43.10	Evaluate an existing security posture and identify gaps and vulnerabilities in security.
	43.11	Describe the types of penetration tests (i.e., human, physical, wireless, data networks, telecommunications), the goals of each type, the metrics tested, and the value of their results.
	43.12	Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
	43.13	Describe common testing methodologies and standards used in penetration testing.
	43.14	Demonstrate proficiency in basic forensic concepts.
	43.15	Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
	43.16	Create a risk management framework.
	43.17	Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
	43.18	Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, and Appendices).
	43.19	Describe the purpose and scope of an IT security disaster recovery plan.
	43.20	Describe the purpose and scope of an IT security business continuity plan.
	43.21	Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	43.22	Describe the forensic and evidentiary considerations when determining containment.
	43.23	Describe the types and sources of data collected for forensic analysis.
	43.24	Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
	43.25	Explain the processes by which data is collected for analysis.
	43.26	Describe the role of system event logs in data collection.
	43.27	Describe the role of the process log in data collection.
	43.28	Describe the processes associated with preserving evidence collected for forensic purposes.
	43.29	Describe how the chain of custody can be maintained for evidence collected during a forensic analysis effort.
44.0	Exhibit proficiency in managing hardware involved in imaging and data collection activities. The student will be able to:	
	44.01	Discuss the different types of Motherboard Connections.
	44.02	Explain the components that comprise a Motherboard and their functions.
	44.03	Describe the different types of permanent storage.
	44.04	Compare and contrast the different host interface standards.
	44.05	Describe how Solid State Storage processes differ from traditional storage.

	44.06 Discuss the different types of removable media and their impacts on data collection.
	44.07 Explain the concepts of RAID including the different Levels and their impacts on the imaging and collection process.
	44.08 Compare and contrast the read/write process of both permanent and temporary storage devices.
	44.09 Compare the standard boot process to the Forensic/controlled boot process.
45.0	Illustrate competence in analyzing common file systems. The student will be able to:
	45.01 Define the Master Boot Record (MBR) and discuss its purpose and any important items that it may contain.
	45.02 Explain the purpose of the Boot Parameter Block (BPB) and its components.
	45.03 Discuss the different File Systems available in an OS environment. Identify the strengths and weaknesses of each system.
	45.04 Explain the process of file creation and deletion in an OS environment including the concept of file artifacts.
	45.05 Discuss the formatting process in an OS environment.
	45.06 Explain pertinent OS system files related to data storage and their functions.
	45.07 Discuss how Windows handles the concept of Date and Time in relation to file management and how it differs from UNIX-like operating systems.
	45.08 Define the different file systems that can be used with removable media.
	45.09 Explain the concepts of Open and Closed sessions.
46.0	Apply knowledge in performing computer forensics investigations. The student will be able to:
	46.01 Create security incident handling and response policies.
	46.02 Recover deleted, encrypted, or damaged file information as evidence for civil or criminal cases.
	46.03 Deploy proprietary and/or open-source tools to identify an intruder’s footprints.
	46.04 Coordinate incident response activities in cooperation with law enforcement agencies.
	46.05 Prepare proper documentations of chain of custody, accounting for where each evidence item originated from, where it is going, and what entity has possession of the evidence.
	46.06 Preserve forensic integrity of evidence so they can be admissible in court.
	46.07 Describe moral and ethical standards in conducting digital forensics investigations.
47.0	Apply knowledge in performing mobile device forensics. The student will be able to:
	47.01 Preserve, acquire, and examine data stored on mobile devices.
	47.02 Perform forensic acquisition and examination of SIM cards.
	47.03 Apply forensic principles and tools to mobile and IoT devices.
	47.04 Demonstrate proficiency in using open-source and proprietary mobile device forensics tools.

	47.05 Compare forensic acquisition tools and validate the completeness and accuracy of results.
	47.06 Describe forensic acquisition and examination of GPS navigation devices.
	47.07 Utilize the results from mobile device forensics for internal investigations or in civic/criminal litigation.
48.0	Create and implement incident handling and response processes. The student will be able to:
	48.01 Design an incident response plan including assessment, communication, containment, evaluation, recovery, and documentation.
	48.02 Describe information-hiding techniques.
	48.03 Describe the steps required to collect, seize, and protect evidence.
	48.04 Recover data from various storage devices after physical and/or logical damage.
	48.05 Search and report on memory in real time with live and system forensics.
	48.06 Investigate network traffic using log files, time analysis, sniffers, and other traffic analysis tools.
	48.07 Explain the legal considerations to investigating emails as prescribed in the Electronic Communications Privacy Act.
	48.08 Identify email tracing techniques in forensic investigations.
49.0	Identify key pieces of legislation and processes related to digital forensics. The student will be able to:
	49.01 Describe the importance of creating an accurate representation of the facts.
	49.02 Explain the components of the Discovery Process.
	49.03 Discuss the 4th Amendment and its impact on the digital forensics investigative process.
	49.04 Identify laws and court cases related to computer forensics and their impacts on the investigation process.
	49.05 Identify and explain the basic Federal Rules of Evidence.
	49.06 Compare and contrast the different qualifications required to be a licensed computer forensics professional from state to state.
	49.07 Define the concept of a subpoena and explain the process of how one is obtained.
	49.08 Explain the steps required to acquire a search warrant.
	49.09 Discuss the concept of consent and the ways that it can be granted.
	49.10 Compare the legal process for civil and criminal cases.
	49.11 Define the concept of expert testimony and the process involved in being classified as an expert.
	49.12 Discuss appropriate courtroom behavior.
50.0	Define the tasks related to the casework process. The student will be able to:
	50.01 Explain the steps involved in maintaining the integrity of digital evidence.

	50.02 Discuss the process of creating a forensics image.
	50.03 Define hashing and explain its uses in ensuring image authenticity.
	50.04 Describe sector slack space and its potential impact on evidence gathering.
	50.05 Describe the importance of documenting the examination process.
	50.06 Explain control/security access logs for images and their importance in maintaining evidence.
	50.07 Describe the steps involved in preparing evidence and documents for trial.
	50.08 Explain the procedures involved in creating a digital forensics investigation report including examples of report formats.
	50.09 Discuss the importance of the Summation and Analysis sections of the digital investigation report.
IP Communications Specialization	
51.0	Demonstrate the understanding of IP communications. The student will be able to:
	51.01 Describe the supported multivendor hardware platforms for VoIP technology, their limits, and their boundaries.
	51.02 Describe how Voice Gateways function in an IP Telephony (IPT) solution.
	51.03 Identify and describe the Local Area Network (LAN) switching products useable in an IPT solution.
52.0	Explain digitizing voice traffic and voice compression standards. The student will be able to:
	52.01 Identify the steps required for analog to digital conversion in a VoIP network.
	52.02 Identify the signaling steps required to complete a Public Switched Telephone Network (PSTN) call.
	52.03 Define the function of Private Branch eXchanges (PBX) or key systems.
	52.04 Configure Foreign eXchange Subscriber (FXS) and Foreign eXchange Office (FXO) interfaces on a Voice Gateway.
53.0	Identify and explain Quality of Service (QoS) requirements in a converged data and voice network. The student will be able to:
	53.01 Identify the steps required to minimize jitter, packet loss and serialization delay in a VoIP network.
	53.02 Explain the function of IP precedence and different Class of Service (CoS) types.
	53.03 Identify and list the types of traffic coming into the interface and defining their relative priority.
	53.04 Configure a priority or custom queuing list.
54.0	Explain the types of IP communication-design options. The student will be able to:
	54.01 Identify the most appropriate gateway in IP communication design.
	54.02 Identify and describe dial plan architecture in IP communication design.
	54.03 Identify the correct route patterns, filters, and use of wild cards in VoIP design scenarios.

	54.04 List available classes of services in IP communication design and their constraints.
	54.05 Describe how to use digit manipulation in VoIP design.
	54.06 Identify the appropriate QoS tools needed for the proper operation of voice traffic on a network.
55.0	Demonstrate proficiency in troubleshooting IP communications. The student will be able to:
	55.01 Identify the appropriate method for providing redundancy in VoIP design.
	55.02 Describe the tools used in troubleshooting IP communication networks.
	55.03 Identify and describe the different call flows and series of events through the call traces and debug outputs when troubleshooting.
	55.04 List the alarms used in IP communication troubleshooting.
56.0	Explain deployment of advanced Voice over IP (VoIP) and data bundle solutions to provide a single network connection for phone services and high-speed Internet. The student will be able to:
	56.01 Identify the required bandwidth speeds needed for uninterrupted service and fast uploads and downloads.
	56.02 Describe the impact of voice samples, codecs, and packet size on bandwidth.
	56.03 Describe on demand use of voice/data and voice prioritization, delivered over a private/secure line.
	56.04 Describe features for a VoIP and data bundle.
	56.05 Describe VoIP and data bundle used to dynamically alternate between voice and Internet as call volume needs dictate.
57.0	Illustrate knowledge of using Statistical Analysis System *(*SAS) sessions to exchange data by using the TCP/IP communications access method. The student will be able to:
	57.01 Identify that a SAS/SHARE server ID has been added to the TCP/IP SERVICES file.
	57.02 Describe how to invoke SAS sessions utilizing TCP/IP communications access method.
	57.03 Describe syntax used to identify port numbers, defined in the client TCP/IP SERVICES file.
58.0	Identify key concepts for Video over IP. The student will be able to:
	58.01 Describe video over IP systems using existing standards to reduce the data to a bitstream and then an IP network to carry the encapsulated data in a stream of IP packets.
	58.02 Describe the quality of service requirements which must be fulfilled for use in broadcast carrying video over IP networks.
	58.03 Describe bandwidth requirements, the maximum allowable packet loss rate, and approaches to achieve acceptable bandwidth such as quantity of service, network admission control, bandwidth reservation, traffic shaping, and traffic prioritization techniques.
	58.04 Describe latency variation and its effect on making synchronization more complex by making the recovery of the underlying timing of the video signal far more difficult.
Advanced Network Infrastructure Specialization	
59.0	Explain basic routing concepts. The student will be able to:

	59.01 Describe the purpose, architecture, and operations of a router.
	59.02 Identify the hardware and software components of routers.
	59.03 Explain the purpose and nature of routing tables.
	59.04 Interpret administrative distance and routing metrics such as hop counts and cost.
	59.05 Explain how a router determines a path and switches packets.
	59.06 Apply correctly between static and dynamic routing.
	59.07 Design a Classful and Classless routing table.
	59.08 Apply Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
	59.09 Describe how network protocols converge.
60.0	Explain operation of routing protocols. The student will be able to:
	60.01 Describe the characteristics and differences of distance vector vs link state routing protocols.
	60.02 Explain the optimum deployment for each type (distance vector vs link state protocols).
	60.03 Describe the features and operation of current interior and exterior routing protocols.
	60.04 Identify network resources needed for implementing various routing protocols.
61.0	Demonstrate router configuration skills. The student will be able to:
	61.01 Configure static and dynamic routing on a Integrated Services Router (ISR).
	61.02 Apply and verify basic router configuration using the Command Line Interface.
	61.03 Design and implement a class 'C' classless IP addressing scheme for a small network.
	61.04 Use advanced IOS CLI configuration commands.
	61.05 Configure Single Area OSPF routing in a network.
	61.06 Fine-tune OSPF settings on a router, including the configuration of reference bandwidth, redistribution of static and default routes, and modification of OSPF intervals, in order to optimize network performance.
	61.07 Verify and troubleshoot router operations in an OSPF network.
	61.08 Configure and modify router metric to improve network performance.
	61.09 Explain route summarization for an IPv4 and IPv6 network.
	61.10 Verify and troubleshoot router operations in complex networks.
	61.11 Document and verify results for an OSPF implementation.
62.0	Explain LAN design and concepts. The student will be able to:

	62.01 Identify the layers and functions of switched network architecture.
	62.02 Describe the principles and benefits of hierarchical network design.
	62.03 Explain the technology and media access control method for Ethernet networks.
	62.04 Explain the differences between layer 2 and layer 3 switch.
	62.05 Describe the operation of a LAN switch.
	62.06 Interpret the benefits of Virtual Local Area Networks (VLAN).
	62.07 Outline the purpose and operation of VLAN Trunking Protocol (VTP) in the management of switched networks.
	62.08 Explain the purpose and operation of Spanning Tree Protocol (STP), and its variants.
	62.09 Design and configure the use of Inter-VLAN routing to connect different Networks in a switch-based network topology.
	62.10 Analyze business requirements and design a LAN structure to meet those requirements.
	62.11 Discuss quality-of-service considerations to prioritize traffic flows in switches and routers.
	62.12 Describe the fundamentals of a Voice VLAN.
	62.13 Describe the fundamentals of video traffic in QoS.
	62.14 Configure switch-port security on switchports.
	62.15 Configure standard switch and router security.
63.0	Demonstrate VLAN configuration skills. The student will be able to:
	63.01 Perform and verify initial LAN switch configuration tasks including remote access management, switch port modes, and trunks.
	63.02 Configure, verify, and troubleshoot VLANs on a LAN switch.
	63.03 Configure Inter-VLAN routing on a 3 layer Switch or Router.
	63.04 Configure and troubleshoot Spanning Tree Protocol and its variants on a switched network environment.
	63.05 Configure and verify the bridge-id and priority to optimize STP.
	63.06 Establish and configure port priorities.
	63.07 Describe basic VPN technologies.
	63.08 Explain branch access technologies.
	63.09 Configure private VLANs.
	63.10 Configure basic Standard, Extended, and Named ACLs.
	63.11 Configure switch-to-switch connectivity for the VLAN based solution.

	63.12	Configure loop prevention for the VLAN based solution.
	63.13	Configure Access Ports for the VLAN based solution.
	63.14	Determine network resources needed for implementing a VLAN based solution on a network.
	63.15	Create a VLAN based implementation plan.
	63.16	Create a VLAN based verification plan.
	63.17	Verify the VLAN based solution was implemented properly using show and debug commands.
	63.18	Document the verification after implementing a VLAN solution.
64.0	Demonstrate an understanding of network maintenance, support and troubleshooting. The student will be able to:	
	64.01	Identify, interpret and maintain network documentation, procedures and practices.
	64.02	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
	64.03	Describe standard operating procedures for troubleshooting hardware and software.
	64.04	Identify procedures to manage, maintain and backup router and switch system and configuration files.
	64.05	Recognize and resolve hardware and software configuration problems.
	64.06	Identify and resolve common network problems at layers 1, 2, 3, and 7 using a layered model approach. Describe the use and features of diagnostic test equipment.
	64.07	Determine type of programs and procedures required to: baseline network performance, identify intrusion and unacceptable system use, identify performance issues, predict system failures, and optimize network availability.
	64.08	Operate network monitoring and management tools effectively to integrate and manage network resources.
	64.09	Explain RMON and SNMP and their use in monitoring a network.
	64.10	Select appropriate deployment SNMP traps or alerts to monitor the network.
	64.11	Establish and document a network baseline.
	64.12	Compare and analyze initial performance measurements with the availability of critical network devices and connections to determine the difference between abnormal behavior and proper network performance as the network grows or traffic patterns change.
	64.13	Optimize traffic flows based on analysis of traffic types, characteristics and user needs.
	64.14	Identify network characteristics and resources suitable for implementing a switch-based Layer 3 solution.
	64.15	Design a verification plan for the switch-based Layer 3 solution.
	64.16	Configure Layer 3 security.
	64.17	Develop a plan to monitor and manage a network.

64.18	Perform network monitoring using IOS tools.
64.19	Perform routine IOS device maintenance.
64.20	Isolate sub-optimal internetwork operation at the correctly defined OSI Model layer.
64.21	Troubleshoot OSPF.
64.22	Troubleshoot a routing redistribution solution.
64.23	Troubleshoot a DHCP client and server solution.
64.24	Troubleshoot NAT.
64.25	Troubleshoot first hop redundancy protocols.
64.26	Troubleshoot IPv6 routing.
64.27	Troubleshoot IPv6 and IPv4 interoperability.
64.28	Troubleshoot switch-to-switch connectivity for the VLAN based solution.
64.29	Troubleshoot loop prevention for the VLAN based solution.
64.30	Troubleshoot access ports for the VLAN based solution.
64.31	Troubleshoot private VLANS.
64.32	Troubleshoot port security.
64.33	Troubleshoot general switch security.
64.34	Troubleshoot switch virtual interfaces (SVIs).
64.35	Troubleshoot switch supervisor redundancy.
64.36	Troubleshoot Layer 3 security.
64.37	Troubleshoot issues related to ACLs used to secure access to Cisco routers.
64.38	Troubleshoot configuration issues related to accessing the AAA server for authentication purposes.
64.39	Troubleshoot security issues related to IOS services (i.e., finger, NTP, HTTP, FTP, RCP).
Linux System Administrator Specialization	
65.0	Demonstrate ability to use essential tools. The student will be able to:
65.01	Access a shell prompt and issue commands with correct syntax.
65.02	Demonstrate the use of standard-in, standard-out, standard-error, and pipe.
65.03	Demonstrate the use of grep and regular expressions to analyze text.

	65.04 Access remote systems using ssh.
	65.05 Log in and switch users in multiuser targets.
	65.06 Archive, compress, unpack, and uncompress files using a variety of tools.
	65.07 Create and edit text files.
	65.08 Create, delete, copy, and move files and directories.
	65.09 Implement hard and soft links appropriately.
	65.10 List, set, and change standard ugo/rwx permissions.
	65.11 Locate and interpret system documentation including man, info, and files in /usr/share/doc.
66.0	Demonstrate ability to run operating systems. The student will be able to:
	66.01 Boot, reboot, and shut down a system normally.
	66.02 Boot systems into different targets manually.
	66.03 Interrupt the boot process in order to gain access to a system.
	66.04 Identify CPU/memory intensive processes, adjust process priority with renice, and kill processes.
	66.05 Locate and interpret system log files and journals.
	66.06 Perform various logging related activities such as configuring logging, log rotation and log reporting.
	66.07 Access a virtual machine's console.
	66.08 Explain the meaning and use of common metrics such as utilization values for CPU, memory, disk space, disk I/O, and network bandwidth.
	66.09 Start and stop virtual machines.
	66.10 Start, stop, and check the status of network services.
	66.11 Securely transfer files between systems.
67.0	Configure local storage. The student will be able to:
	67.01 List, create, delete partitions on MBR and GPT disks.
	67.02 Create and remove physical volumes, assign physical volumes to volume groups, and create and delete logical volumes.
	67.03 Configure systems to mount file systems at boot by Universally Unique ID (UUID) or label.
	67.04 Create, use and remove snapshots of logical volumes.
	67.05 Add new partitions and logical volumes and swap to a system non-destructively.
68.0	Create and configure file systems. The student will be able to:

	68.01 Create, mount, unmount, and use various file systems.
	68.02 Mount and unmount CIFS and NFS network file systems.
	68.03 Extend existing logical volumes.
	68.04 Discuss the use of setuid and setgid.
	68.05 Create and manage Access Control Lists (ACLs).
	68.06 Troubleshoot file permission problems.
69.0	Demonstrate skills to deploy, configure, and maintain systems. The student will be able to:
	69.01 Configure networking and hostname resolution statically or dynamically.
	69.02 Schedule tasks using at and cron.
	69.03 Start and stop services and configure services to start automatically at boot.
	69.04 Configure systems to boot into a specific target automatically.
	69.05 Perform an unattended system install.
	69.06 Configure a physical machine to host virtual guests.
	69.07 Install Linux systems as virtual guests.
	69.08 Configure systems to launch virtual machines at boot.
	69.09 Configure network services to start automatically at boot.
	69.10 Configure a system to use time services.
	69.11 Install and update software packages from a remote repository or a local file system.
	69.12 Update the kernel package appropriately to ensure a bootable system.
	69.13 Modify the system bootloader.
70.0	Manage users and groups. The student will be able to:
	70.01 Create, delete, and modify local and global user accounts.
	70.02 Change passwords and adjust password aging for local and global user accounts.
	70.03 Create, delete, and modify local and global groups and group memberships.
	70.04 Configure a system to use an existing authentication service for user and group information.
71.0	Manage security. The student will be able to:
	71.01 Describe basic concepts and mechanisms, including encryption, password safety, message digests and system security requirements.

	71.02 Apply proper security techniques and monitoring.
	71.03 Configure firewall settings using firewall-config, firewall-cmd, or iptables.
	71.04 Configure key-based authentication for SSH.
	71.05 Set enforcing and permissive modes for SELinux.
	71.06 List and identify SELinux file and process context.
	71.07 Restore default file contexts.
	71.08 Use boolean settings to modify system SELinux settings.
	71.09 Troubleshoot SELinux policy violations.
72.0	Demonstrate employability skills. The student will be able to:
	72.01 Conduct effective job search.
	72.02 Secure information about potential job opportunities.
	72.03 Identify and prepare commonly required documents for job applications.
	72.04 Accurately complete a job application form.
	72.05 Demonstrate effective job interview skills.
	72.06 Apply appropriate decision-making strategies appropriate to workplace and career contexts.
	72.07 Exhibit appropriate work/behavioral habits.
	72.08 Demonstrate acceptable employee personal hygiene and health standards consistent with workplace expectations.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030 (4) F.A.C. identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science degree and the Associate of Applied Science degree. In addition, Rule 6A-14.0303 FAC implements section 1007.25 Florida Statutes and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Advanced Network Infrastructure (0511100115) – 36 credit hours
Advanced Network Virtualization (0511100117) – 34 credit hours
Digital Forensics (0511100119) – 32 credit hours
IP Communications (0511100120) – 32 credit hours
Linux System Administrator (0511100122) – 24 credit hours
Network Enterprise Administration (0511100113) – 29 credit hours
Network Infrastructure (0511100114) – 21 credit hours
Network Security (0511100118) – 30 credit hours
Network Server Administration (0511100112) – 24 credit hours
Network Support Technician (0511100121) – 21 credit hours
Network Virtualization (0511100116) – 24 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Cybersecurity Operations**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511100300
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as, cybersecurity operations analyst, security engineer, cybersecurity operations technician, data communication analyst, intrusion and detection analyst, security architect, or secure software developer in the Information Technology career cluster; which provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of network security, installing, configuring, monitoring, and detecting network violations in the LAN/WAN environment.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:

- Related CCC and ATD credentials.
- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate a fundamental understanding of computer networking.
02.0 Demonstrate understanding of networked environments, hardware, and software.
03.0 Demonstrate fundamental proficiency in network security essentials.
04.0 Demonstrate an understanding of the directory services infrastructure and installation.
05.0 Demonstrate an understanding of network access control systems and methodology.
06.0 Demonstrate understanding of routing concepts.
07.0 Demonstrate understanding of routing protocols.
08.0 Demonstrate router configuration skills.
09.0 Perform coding activities
10.0 Perform programming and scripting activities.
11.0 Demonstrate proficiency with Internet structure, organization, and navigation.
12.0 Perform web design/development activities.
13.0 Demonstrate proficiency in analyzing network intrusions
14.0 Demonstrate proficiency in incident handling and response.
15.0 Demonstrate an understanding of how to mitigate network vulnerabilities.
16.0 Legal and ethical issues relative to the information technology environment.
17.0 Communications skills.

Florida Department of Education
Student Performance Standards

Program Title: **Cybersecurity Operations**
CIP Number: **1511100300**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate a fundamental understanding of computer networking. The student will be able to:
01.01	Explain the use of binary numbers and perform binary arithmetic.
01.02	Describe current network environments.
01.03	Describe network communications and architecture.
01.04	Identify network components, media, connectors, applications and protocols.
01.05	Compare and contrast the OSI and TCP/IP reference models and their layers.
01.06	Identify and describe current relevant IEEE network standards.
01.07	Create an IP addressing scheme using Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
01.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
01.09	Identify and discuss issues related to naming conventions for user IDs, email, passwords, and network hosts and devices.
01.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
01.11	Describe the major functions of LAN protocols.
01.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
01.13	Configure and manage the TCP/IP protocol stack.
01.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
01.15	Identify emerging technologies and discuss related technical issues.
01.16	Design a local area network (LAN), including the specification of architecture, hardware and software.
01.17	Identify the advantages and use of virtual local area networks (VLANs).
01.18	Identify and explain wide area network (WAN) concepts.
01.19	Plan, configure and test a small network and establish baselines.
01.20	Describe the major functions of network server software components.

	01.21 Install applications on a server and configure clients for network access.
02.0	Demonstrate understanding of networked environments, hardware, and software. The student will be able to:
	02.01 Give several advantages and disadvantages of networked and non-networked environments.
	02.02 Describe current network environments and network topologies.
	02.03 Identify and discuss issues such as security, privacy and redundancy related to networked environments.
	02.04 Identify and discuss standardization issues related to naming conventions.
	02.05 List and define layers in the OSI and TCP/IP network protocol models.
	02.06 Identify and describe current relevant IEEE standards.
	02.07 Discuss the nature of IP and MAC addressing.
	02.08 Describe the major functions and requirements of web-based server and client hardware and software components.
	02.09 Identify various of specialized servers.
	02.10 Recognize and describe current cable technologies.
	02.11 Describe current wireless technologies.
	02.12 Describe the major functions of network connectivity hardware, such as hubs, repeaters, bridges, routers, switches, and gateways.
	02.13 Describe the hardware needed to connect a LAN to the Internet.
	02.14 Describe the function of network storage devices and other peripherals.
	02.15 Compare and contrast major functions and features of current network operating systems (including directory services).
	02.16 Differentiate between telecommunications and data communications.
	02.17 Compare and contrast digital communications lines and cable characteristics (e.g. ISDN, DSL, T-1, T-3).
03.0	Demonstrate fundamental proficiency in network security essentials. The student will be able to:
	03.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	03.02 Define and describe malicious software and techniques to protect systems from its effects.
	03.03 Describe Denial of Service attacks and means to defend against them.
	03.04 Identify the risks and techniques of data loss and its prevention.
	03.05 Describe the principles and techniques of securing data storage and transmission.
	03.06 Identify current encryption and authentication standards.
	03.07 Implement security policies, including compliance and operational security.

	03.08 Enable access control, identity management and security logging.
	03.09 Manage client and network system security software and related updates.
	03.10 Describe the functions and characteristics of firewalls.
	03.11 Perform a ping sweep to identify network hosts.
	03.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	03.13 Describe the purpose and operation of network protocol analyzers.
	03.14 Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
04.0	Demonstrate an understanding of the directory services infrastructure and installation. The student will be able to:
	04.01 Describe the architecture of Active Directory.
	04.02 Discuss how Active Directory works.
	04.03 Describe the Active Directory design, plan, and implementation processes.
	04.04 Create a forest and domain structure.
	04.05 Configure the Domain Name Service (DNS) in an Active Directory environment.
	04.06 Raise the functional level of a forest and a domain.
	04.07 Create, manage, and delegate administrative control for organizational units.
05.0	Demonstrate an understanding of network access control systems and methodology. The student will be able to:
	05.01 Specify by access control mechanisms what users can do, which resources they can access, and what operations they can perform on a system.
	05.02 Compare and contrast access control techniques.
	05.03 Administer computer, group, and user accounts.
	05.04 Manage policies, rights, permissions, and passwords for users and/or groups of users.
	05.05 Demonstrate an understanding of various access control models.
	05.06 Manage password, PIN selection, maintenance, and control.
	05.07 Demonstrate an understanding of methods of identification and authentication.
	05.08 Implement centralized/remote authentication access controls.
	05.09 Implement and manage decentralized access controls such as domain and trust relationships.
	05.10 Analyze methods of server attacks.
	05.11 Demonstrate an understanding of the different types of intrusions and the different methods of intrusion detection.

	05.12 Monitor the network using various forms of intrusion detection resources to detect attacks.
	05.13 Investigate audit trails for signs of network intrusions.
	05.14 Perform penetration testing to find weaknesses in the access control systems.
06.0	Demonstrate understanding of routing concepts. The student will be able to:
	06.01 Describe the purpose, architecture, and operations of a router.
	06.02 Identify the hardware and software components of routers.
	06.03 Explain the purpose and nature of routing tables.
	06.04 Describe administrative distance and routing metrics such as hop counts and cost.
	06.05 Describe how a router determines a path and switches packets.
	06.06 Differentiate between static and dynamic routing.
	06.07 Explain the differences between class-full and classless routing.
	06.08 Describe the use and operation of VLSM and CIDR.
	06.09 Describe how a network converges.
07.0	Demonstrate an understanding of routing protocols. The student will be able to:
	07.01 Describe the characteristics of distance vector routing protocols.
	07.02 Describe the characteristics of link state routing protocols.
	07.03 Describe the differences between distance vector and link state routing protocols and determine the best routing protocol to use in a given situation.
	07.04 Describe the features and operation of current internal and external routing protocols.
08.0	Demonstrate router configuration skills. The student will be able to:
	08.01 Configure and verify router interfaces.
	08.02 Perform basic router configuration using the Command Line Interface (CLI) to inspect the operations of the router.
	08.03 Design and implement a classless IP addressing scheme for a network.
	08.04 Configure a router for RIP version 2 operation.
	08.05 Use advanced configuration commands with routers.
	08.06 Configure and modify metric on a router to improve network performance.
	08.07 Configure summarization and default route settings on a router to optimize network performance
	08.08 Verify and troubleshoot router operations in complex network environment.

09.0	Perform coding activities. The student will be able to:
09.01	Identify modules.
09.02	Design modules.
09.03	Code modules.
09.04	Document modules.
09.05	Test modules.
09.06	Debugging code.
09.07	Revise code.
09.08	Assemble modules.
10.0	Perform programming and scripting activities. The student will be able to:
10.01	Identify several of the most prominent current programming languages.
10.02	Characterize the stages of the system development life cycle.
10.03	Differentiate between two common strategies for problem solving.
10.04	Describe the program design and development process.
10.05	Differentiate between structured programming and object-oriented programming.
10.06	Use procedural and object-oriented constructs of programming, scripting, and/or macro languages to create and test programs.
10.07	Apply principles of good design and documentation when developing programs.
10.08	Design, review, and test specifications and algorithms.
10.09	Write program according to specifications and revise based on testing and debugging.
11.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
11.01	Describe the origin of the Internet.
11.02	Outline the history of the Internet.
11.03	Describe Internet organization, such as the InterNIC, domains and requests for comments (RFCs).
11.04	Describe the structure of the Internet.
11.05	Differentiate between the Internet and the WWW.
11.06	Differentiate among an Intranet site, an extranet site, and an Internet site.
11.07	Describe and identify several major ethical and legal issues related to Internet use and how they affect intellectual property rights.

	11.08 Describe the World Wide Web (WWW) and identify how it affects personal security and privacy and our society.
	11.09 Describe and differentiate between file types and protocols.
	11.10 Demonstrate the use of typical remote access mechanisms.
	11.11 Describe various sections of a URL.
12.0	Perform web design/development activities. The student will be able to:
	12.01 Describe and use the process of storyboarding a website.
	12.02 Describe format, structure and design principles for websites.
	12.03 Identify existing resources and constraints.
	12.04 Create site navigation plan including directory structure.
	12.05 Procure/create and incorporate standard and animated graphics into a webpage.
	12.06 Design page templates to implement on final site.
	12.07 Create a webpage using authoring tools.
	12.08 Code page(s) using current web programming languages.
	12.09 Check page for cross-browser capability and other access issues.
	12.10 Upload pages and run site analysis.
	12.11 Incorporate sound files onto a webpage.
	12.12 Incorporate a streaming video file onto a webpage.
	12.13 Incorporate a video file for download into a webpage.
	12.14 Perform simple graphic modifications using a graphics utility.
	12.15 Incorporate an e-mail link on a webpage.
	12.16 Incorporate internal and external links on a webpage.
	12.17 Incorporate file transfer capabilities on a webpage.
	12.18 Incorporate handicapped-accessibility options into the website.
	12.19 Create a web form and produce e-mail results.
13.0	Demonstrate proficiency in analyzing network intrusions. The student will be able to:
	13.01 Describe the role of a Cybersecurity Operations Analyst in the enterprise.
	13.02 Describe various software applications needed to support cybersecurity analyses.

	13.03 Describe the operation of the network infrastructure
	13.04 Demonstrate how to analyze network intrusion data to identify compromised hosts and vulnerabilities.
	13.05 Identify various network security alerts.
	13.06 Correctly analyze intrusion data to determine potential exploits.
	13.07 Describe the types of log files used in security monitoring.
	13.08 Demonstrate the use of websites to generate malware analysis.
14.0	Demonstrate proficiency in incident handling and response. The student will be able to:
	14.01 Classify the various types of network attacks.
	14.02 Manage evidentiary data in an electronic environment.
	14.03 Describe the essential elements of forensic analysis.
	14.04 Describe incident response models used to manage network security incidents.
15.0	Demonstrate an understanding of how to mitigate network vulnerabilities. The student will be able to:
	15.01 Describe various methods to prevent malicious access to computer networks, hosts, and data.
	15.02 Describe the impacts of cryptography on network security monitoring.
	15.03 Describe how to investigate endpoint vulnerabilities.
16.0	Legal and ethical issues relative to the information technology environment. The student will be able to:
	16.01 Discuss the types of works that are protected by intellectual property laws.
	16.02 Discuss the basic elements of a contract.
	16.03 Discuss email litigation, including anti-spam laws.
	16.04 Discuss email use and ownership.
	16.05 Describe customer and employee privacy issues and safeguards.
	16.06 Develop examples of acceptable use policies.
	16.07 Compare organizational codes of ethics.
	16.08 Research industry standards and codes of conduct for information technology professionals.
	16.09 Write a personal code of ethics.
17.0	Communications skills. The student will be able to:
	17.01 Write logical and clear statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.

17.02	Read and explain graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
17.03	Deliver and follow oral and written instructions.
17.04	Answer and ask questions coherently and concisely.
17.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
17.06	Demonstrate appropriate communication skills.
17.07	Prepare and deliver a technical presentation.
17.08	Observe and interpret verbal and nonverbal behavior.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030 (4) F.A.C. identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science degree and the Associate of Applied Science degree. In addition, Rule 6A-14.0303 FAC implements section 1007.25 Florida Statutes and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Cybersecurity Operations Analyst (0511100313) -- 24 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Created 2020-2021

Florida Department of Education
Curriculum Framework

Program Title: **IT Security**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511100307
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to work in Internet, intranet, extranet, and enterprise environments; installing, configuring, designing, and managing secure database and E-commerce resources.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.

- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of computer hardware.
02.0 Demonstrate an understanding of networked environments, hardware, and software.
03.0 Install and configure secure network systems software and utilities.
04.0 Demonstrate proficiency with Internet structure, organization, and navigation.
05.0 Demonstrate an understanding of network access control systems and methodology.
06.0 Describe cryptography concepts, standards, and applications.
07.0 Perform telecommunications and network security activities.
08.0 Demonstrate an understanding of Database Management Systems (DBMS).
09.0 Perform administrative tasks related to database security.
10.0 Demonstrate an understanding of E-commerce.
11.0 Perform tasks related to E-commerce security.
12.0 Perform webserver and site management activities.
13.0 Design and implement physical security measures.
14.0 Perform operation and security management practices.
15.0 Employ applications and systems development security techniques.
16.0 Develop business continuity and disaster recovery plans.
17.0 Describe ethical issues, pertinent laws, and how to conduct investigations.
18.0 Perform general organizational computing workplace competencies.
19.0 Perform project planning and management activities.
20.0 Perform documentation and technical reference activities.
21.0 Demonstrate employability skills.
22.0 Demonstrate professional development skills.

Florida Department of Education
Student Performance Standards

Program Title: **IT Security**
CIP Number: **1511100307**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of computer hardware. The student will be able to:
01.01	Describe multiple numbering systems used to represent instructions and data.
01.02	Identify the architecture of major hardware platforms.
01.03	Describe the functions of major hardware components of a computer system.
01.04	Discuss the potential impact of emerging hardware technologies.
01.05	Demonstrate the ability to perform preventive maintenance tasks on microcomputer systems.
01.06	Set up and configure computer systems and peripherals.
01.07	Configure the Basic Input/Output System (BIOS) of a computer system.
01.08	Install and configure storage devices, controllers, and network interfaces.
02.0	Demonstrate an understanding of networked environments, hardware, and software. The student will be able to:
02.01	Discuss fundamental network concepts such as topology, protocols, architecture, and internetworking.
02.02	Define all layers in the Open Systems Interconnect (OSI) and Transmission Control Protocol/Internetworking Protocol (TCP/IP) network protocol models.
02.03	Discuss the nature of Internetworking Protocol (IP) addresses and Media Access Control (MAC) addresses, and mapping between protocol addressing schemes.
02.04	Describe the functions and hardware requirements for current popular network servers and services.
02.05	Describe the major functions and hardware requirements of network client hardware components.
02.06	Describe current link technologies such as twisted-pair, coaxial, fiber optic, and wireless.
02.07	Describe the major functions of network connectivity hardware.
02.08	Describe the function of network storage devices, storage area networks (SAN), and other peripherals.
03.0	Install and configure secure network systems software and utilities. The student will be able to:
03.01	Install and configure current leading system software, drivers, and service packs.
03.02	Install, configure and set up a proxy server and a gateway.

03.03	Discuss the functions of authentication protocols and Virtual Private Networks (VPNs).
03.04	Install and configure web servers and related services.
03.05	Use system software to perform routine maintenance tasks such as backup and hard drive defragmentation.
03.06	Install and configure a secure desktop client operating system (OS).
03.07	Describe modifications necessary to an OS such as modifying parameters and how to handle conflicting interrupts when installing, configuring, and upgrading application software.
03.08	Install and configure client software for network-based applications.
03.09	Install and configure current popular network services for servers.
04.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
04.01	Describe Internet structure and administration.
04.02	Describe common Internet services and port numbers.
04.03	Demonstrate the use of internetworking protocols.
04.04	Differentiate between push and pull technologies.
04.05	Demonstrate the use of typical remote access mechanisms.
04.06	Describe the data format and proprietary nature of commonly used Internet file types.
04.07	Demonstrate use of Internet clients and services.
05.0	Demonstrate an understanding of network access control systems and methodology. The student will be able to:
05.01	Describe access control mechanisms and their impact on users, resources, and operations.
05.02	Compare and contrast access control techniques.
05.03	Administer computer, group, and user accounts.
05.04	Manage policies, rights, permissions, and passwords for users and/or groups of users.
05.05	Demonstrate an understanding of various access control models.
05.06	Manage password, PIN selection, maintenance, and control.
05.07	Demonstrate an understanding of methods of identification and authentication.
05.08	Implement centralized/remote authentication access controls.
05.09	Implement and manage decentralized access controls such as domain and trust relationships.
05.10	Analyze and explain methods of server attacks.
05.11	Demonstrate an understanding of the different types of network intrusions and the different methods of detection.

	05.12 Monitor the network using various forms of intrusion detection resources to detect attacks.
	05.13 Investigate audit logs for signs of network intrusions.
	05.14 Find and report weaknesses in the access control system using penetration testing.
06.0	Describe cryptography concepts, standards, and applications. The student will be able to:
	06.01 Demonstrate an understanding of the encryption/decryption process.
	06.02 Demonstrate an understanding of the basic functions involved in key management.
	06.03 Describe methods to achieve confidentiality, integrity, and availability through authentication in a network environment.
	06.04 Identify the strengths and weaknesses of cryptographic algorithms and the effects of key length.
	06.05 Employ cryptographic algorithms.
	06.06 Implement current popular key distribution methods.
	06.07 Utilize application and network-based protocols.
	06.08 Describe the use of security hardware components.
07.0	Perform telecommunications and network security activities. The student will be able to:
	07.01 Utilize protocol layering models.
	07.02 Evaluate the security implications associated with the various physical media types.
	07.03 Describe security concerns with using various network topologies.
	07.04 Configure authentication protocol service(s) that provide dial-in authentication and security.
	07.05 Employ network monitors and packet sniffers to identify security threats.
	07.06 Implement security measures using network hardware and software.
	07.07 Discuss the security vulnerabilities of the TCP/IP protocol stack.
	07.08 Configure Network Layer security protocols.
	07.09 Configure Transport Layer security protocols.
	07.10 Configure Application Layer security protocols.
	07.11 Perform connection verification using current authentication protocols.
	07.12 Demonstrate an understanding of how wide area network serial line protocols work.
	07.13 Implement secure data communication techniques.
	07.14 Develop secure email, facsimile, and voice communication procedures to protect against network attacks.

	07.15 Employ alarms and signals to alert network security administrators of intrusions.
08.0	Demonstrate an understanding of Database Management Systems (DBMS). The student will be able to:
	08.01 Compare the major types of databases.
	08.02 Describe relational database concepts.
	08.03 Analyze the various components of a DBMS.
	08.04 Install and configure database server software.
	08.05 Perform database administration tasks using the Structured Query Language (SQL).
	08.06 Demonstrate an understanding of transaction processing and concurrency control.
	08.07 Perform database backup and recovery operations.
09.0	Perform administrative tasks related to database security. The student will be able to:
	09.01 Develop database security guidelines.
	09.02 Monitor database security systems.
	09.03 Manage web database security.
	09.04 Verify security compliance.
	09.05 Secure backup processes.
	09.06 Verify backup processes.
	09.07 Describe techniques to ensure database integrity and security.
10.0	Demonstrate an understanding of E-commerce. The student will be able to:
	10.01 Describe E-commerce and its impact on business and society.
	10.02 Differentiate between the various E-commerce business models.
	10.03 Discuss the steps necessary to maintain transaction integrity.
	10.04 Identify components and procedures necessary to process credit card transactions.
	10.05 Describe applicability of and compliance with Payment Card Industry Data Security Standards (PCI-DSS).
11.0	Perform tasks related to E-commerce security. The student will be able to:
	11.01 Manage digital certificates.
	11.02 Maintain integrity in transaction storage and reporting systems.
	11.03 Protect Personal Identifiable Information (PII) in transaction processes.

	11.04 Describe inventory control measures.
	11.05 Maintain security related to electronic communication.
	11.06 Describe methods used to review third-party transaction processing.
	11.07 Evaluate E-commerce platform vulnerabilities.
12.0	Perform webserver and site management activities. The student will be able to:
	12.01 Describe the process of obtaining an Internet domain name and mapping it to an Internet Protocol (IP) address.
	12.02 Compare features of current website management tools.
	12.03 Configure current web server software.
	12.04 Use current web server software to maintain secure websites.
	12.05 Use website access tracking and analysis tools to evaluate the security of a web server.
13.0	Design and implement physical security measures. The student will be able to:
	13.01 Identify physical threats and vulnerabilities to an enterprise's resources.
	13.02 Specify possible countermeasures to physically protect an enterprise's resources.
	13.03 Develop a list of physical facility requirements to secure the premises.
	13.04 Evaluate the feasibility of various technical controls to secure physical resources.
14.0	Perform operation and security management practices. The student will be able to:
	14.01 Perform personnel administrative security operations.
	14.02 Implement client and network system security software on an enterprise-wide basis.
	14.03 Perform and verify backups of critical information.
	14.04 Identify methods to protect the privacy of personal data.
	14.05 Demonstrate proper handling of sensitive information and media.
	14.06 Demonstrate an understanding of different control types.
	14.07 Determine what enterprise resources require protection.
	14.08 Compare the advantages and disadvantages of internal versus external audits.
	14.09 Perform compliance checks on user adherence to security policies.
	14.10 Identify different types of enterprise-wide monitoring tools and techniques.
	14.11 Utilize enterprise-wide monitoring tools and techniques.

14.12	Implement countermeasures to defend against threats.
14.13	Perform penetration testing activities.
14.14	Describe principles of risk management and asset valuation.
14.15	Monitor enterprise-wide information for potential liabilities.
14.16	Manage software licenses and enforce compliance within the organization.
15.0	Employ applications and systems development security techniques. The student will be able to:
15.01	Describe the stages of the system development life cycle.
15.02	Describe security implications of structured programming techniques.
15.03	Analyze the controls that are included within systems and applications software and those used in the development of agents, applets, software, databases, data warehouses and knowledge-based systems.
15.04	Implement features to ensure data and application integrity, security and availability.
15.05	Analyze distributed environment application issues.
15.06	Analyze local environment application issues.
15.07	Analyze key database and data warehousing issues.
15.08	Develop multilevel security schemes for databases and data warehouses.
15.09	Compare different forms of data/information storage.
15.10	Describe different aspects of application and database security control architectures.
15.11	Compare and contrast elevated privileges and user modes of operation.
15.12	Identify various levels of application integrity.
15.13	Describe the impact that malicious code plays in software development.
15.14	Formulate countermeasures to defend against or detect malicious code.
15.15	Establish a secure development environment.
16.0	Develop business continuity and disaster recovery plans. The student will be able to:
16.01	Perform a business impact assessment.
16.02	Specify the necessary capabilities of alternative business sites.
16.03	Develop business continuity, disaster containment, and recovery plans.
16.04	Identify the impact of scheduled facility maintenance on enterprise systems.
16.05	Develop a testing program for business continuity/disaster recovery plans.

	16.06 Develop a training program for personnel regarding business continuity/disaster recovery plans.
17.0	Describe ethical issues, pertinent laws, and how to conduct investigations. The student will be able to:
	17.01 Explain the major categories and types of laws as they relate to information security.
	17.02 Describe institutional policies and practices regarding data privacy and intellectual property rights.
	17.03 Describe abnormal and suspicious activity as it relates to information security.
	17.04 Identify potential data security threats.
	17.05 Describe legal institutional policies and practices to protect against purposeful violations of data integrity.
	17.06 Identify the major categories of computer crimes and attacks.
	17.07 Describe institutional policies and practices to conduct an investigation of security violations.
	17.08 Explain major ethical and legal issues related to Internet and system use.
18.0	Perform general organizational computing workplace competencies. The student will be able to:
	18.01 Deliver and follow oral and written technical instructions.
	18.02 Prepare and deliver a technical presentation.
	18.03 Participate in group discussions as a member and as a leader.
	18.04 Explain the importance of self-motivation and responsibility in completing assigned tasks.
	18.05 List the steps in problem solving.
	18.06 Identify and discuss issues contained within professional codes of conduct.
	18.07 Explain ethical aspects of intellectual property rights and licensing issues.
	18.08 Identify potential sources of employee/employer or employee/employer conflict and discuss possible approaches to resolve such disagreements.
	18.09 Identify appropriate workplace behavior.
	18.10 Identify principles and techniques for being a productive, contributing member of a team.
	18.11 Identify acceptable strategies for resolving conflict in the workplace.
	18.12 Describe principles and techniques for working productively with people of diverse cultures and backgrounds.
	18.13 Identify techniques for stress management and prevention of job burnout.
	18.14 Identify appropriate communication skills and etiquette.
19.0	Perform project planning and management activities. The student will be able to:
	19.01 List effective time management skills.

	19.02 Describe appropriate measures for planning and managing a large project.
	19.03 Create an implementation schedule for a large project.
	19.04 Describe appropriate measures for planning and implementing upgrades of hardware and software.
	19.05 Identify examples of effective end-user training strategies and techniques.
20.0	Perform documentation and technical reference activities. The student will be able to:
	20.01 Demonstrate technical writing skills.
	20.02 Identify information in printed and online technical references.
	20.03 Prepare documentation to track assets, security-related activities, and incidents.
21.0	Demonstrate employability skills. The student will be able to:
	21.01 Identify sources of employment opportunities.
	21.02 Identify employer expectations regarding attendance, punctuality, initiative and teamwork.
	21.03 Describe employee rights regarding privacy, discrimination, due process and safety.
	21.04 Identify the key requirements of a written job description.
	21.05 Identify methods for securing employment references.
	21.06 Compose a cover letter and a resume.
	21.07 Complete an employment application.
	21.08 Classify behaviors considered appropriate or inappropriate in a job interview situation.
	21.09 Demonstrate job interview skills.
	21.10 Compose a follow-up letter.
	21.11 Compose a letter of resignation.
22.0	Demonstrate professional development skills. The student will be able to:
	22.01 Identify corporate strategies and policies for professional development.
	22.02 Describe the importance of participating in professional organizations and maintaining professional contacts.
	22.03 Explain the importance of mentor relationships.
	22.04 Identify industry trends.
	22.05 Describe options for continuing education.
	22.06 Identify industry journals, magazines and digital media.

22.07 Describe the importance of attending seminars, workshops, and tradeshows.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030 (4) F.A.C. identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science degree and the Associate of Applied Science degree. In addition, Rule 6A-14.0303 FAC implements section 1007.25 Florida Statutes and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Database & E-Commerce Security (0511100311) – 18 credit hours.

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Cybersecurity**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511100308
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and the relevant technical knowledge and skills needed to prepare for further education and careers related to most NICE framework specialty areas, such as: Security Provision (SP), Operate and Maintain (OM), Protect and Defend (PR), Analyze (AN), Collect and Operate (CO), and Investigate (IN). This program provides technical and non-technical skill proficiency and competency-based applied learning. These competencies contribute to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes Cybersecurity Foundational Knowledge Units (KU), Technical and non-Technical Knowledge Units.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
  - Related CCC and ATD credentials.

- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate a fundamental understanding of computer networking.
02.0 Demonstrate understanding of networked environments, hardware, and software.
03.0 Demonstrate fundamental proficiency in network security essentials.
04.0 Demonstrate an understanding of access control systems and methodology.
05.0 Perform secure web design/development activities.
06.0 Perform secure programming and scripting activities.
07.0 Demonstrate an understanding of Cybersecurity Foundations and Principles.
08.0 Demonstrate an understanding of legal, regulatory, and ethical issues related to cybersecurity.
09.0 Demonstrate effective communication and soft skills.
10.0 Explain and apply cryptographic concepts.
11.0 Demonstrate an understanding of secure database concepts.

Florida Department of Education
Student Performance Standards

Program Title: **Cybersecurity**
CIP Number: **1511100308**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate a fundamental understanding of computer networking. The student will be able to:
01.01	Explain the use of binary numbers and perform binary arithmetic.
01.02	Describe current network environments.
01.03	Describe network communications and architecture.
01.04	Identify network components, media, connectors, applications and protocols.
01.05	Compare and contrast the OSI and TCP/IP reference models and their layers.
01.06	Identify and describe current relevant IEEE network standards.
01.07	Create an IP addressing scheme using Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
01.08	Identify and discuss issues related to networked environments, such as security, access control, fair use, privacy and redundancy.
01.09	Identify and discuss issues related to naming conventions for user IDs, e-mail, passwords, and network hosts and devices.
01.10	Identify standard network topologies and describe the advantages and disadvantages of each topology.
01.11	Describe the major functions of LAN protocols.
01.12	Explain the functions of wireless components, standards, hardware, software, and infrastructure design.
01.13	Configure and manage the TCP/IP protocol stack.
01.14	Describe how TCP and UDP Port addresses, IP addresses, and MAC addresses function, and how they are used to deliver data across the network.
01.15	Identify emerging technologies and discuss related technical issues.
01.16	Design a local area network **(**LAN**),** including the specification of architecture, hardware and software.
01.17	Identify the advantages and use of virtual local area networks (VLANs).
01.18	Identify and explain wide area network (WAN) concepts.
01.19	Plan, configure and test a small network and establish baselines.
01.20	Describe the major functions of network server software components.

	01.21 Install applications on a server and configure clients for network access.
	01.22 Describe routing concepts.
02.0	Demonstrate understanding of networked environments, hardware, and software. The student will be able to:
	02.01 Give several advantages and disadvantages of networked and non-networked environments.
	02.02 Describe current network environments and network topologies.
	02.03 Identify and discuss issues such as security, privacy and redundancy related to networked environments.
	02.04 Identify and discuss standardization issues related to-naming conventions.
	02.05 Discuss the nature of IP and MAC addressing.
	02.06 Describe the major functions and requirements of web-based server and client hardware and software components.
	02.07 Identify various specialized servers.
	02.08 Recognize and describe current cable technologies.
	02.09 Describe current wireless technologies.
	02.10 Describe the major functions of network connectivity hardware, such as hubs, repeaters, bridges, routers, switches, and gateways.
	02.11 Describe the hardware needed to connect a LAN to the Internet.
	02.12 Describe the function of network storage devices and other peripherals.
	02.13 Compare and contrast major functions and features of current network operating systems and associated security controls.
	02.14 Differentiate between telecommunications and data communications.
	02.15 Compare and contrast digital communications lines and cable characteristics.
03.0	Demonstrate fundamental proficiency in network security essentials. The student will be able to:
	03.01 Describe common security threats to, and vulnerabilities of, computer systems and the corresponding best practices for mitigation.
	03.02 Define and describe malicious software and techniques to protect systems from its effects.
	03.03 Describe Denial of Service (DoS) attacks and means to defend against them.
	03.04 Identify the risks and techniques of data loss and its prevention.
	03.05 Describe the principles and techniques of securing data storage and transmission.
	03.06 Identify current encryption and authentication standards.
	03.07 Implement security policies, including compliance and operational security.
	03.08 Enable access control, identity management and security logging.

	03.09 Manage client and network system security software and related updates.
	03.10 Describe the functions and characteristics of firewalls.
	03.11 Perform a ping sweep to identify network hosts.
	03.12 Perform a port scan to probe network hosts for open TCP and UDP ports.
	03.13 Describe the purpose and operation of network protocol analyzers.
	03.14 Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
	03.15 Describe the functions and characteristics of IDS (Intrusion Detection Systems) and IPS (Intrusion Prevention Systems).
04.0	Demonstrate an understanding of access control systems and methodology. The student will be able to:
	04.01 Specify by access control mechanisms what users can do, which resources they can access, and what operations they can perform on a system.
	04.02 Compare and contrast access control techniques.
	04.03 Administer computer, group, and user accounts.
	04.04 Discuss policies, rights, permissions, and passwords for users and/or groups of users.
	04.05 Demonstrate an understanding of various access control models.
	04.06 Discuss password, PIN selection, maintenance, and control.
	04.07 Demonstrate an understanding of current and emerging methods of identification and authentication.
	04.08 Discuss centralized/remote authentication access controls.
	04.09 Analyze methods of server attacks.
	04.10 Demonstrate an understanding of the different types of intrusions and the different methods of intrusion detection.
	04.11 Monitor the network using various forms of intrusion detection resources to detect attacks.
	04.12 Investigate audit trails for signs of network Indicators of Compromise (IoC). (i.e., log files, alert reports, error reports, network performance reports, and output from tools to support analysis).
	04.13 Perform penetration testing to find weaknesses in the access control systems.
05.0	Perform secure web design/development activities. The student will be able to:
	05.01 Demonstrate proficiency with Internet structure, organization, and navigation and describe the relation to the Internet and WWW.
	05.02 Describe and use the process of storyboarding a website.
	05.03 Describe format, structure and design principles for websites.
	05.04 Evaluate web graphic utilities and creation tools, including those for animated graphics.
	05.05 Identify existing resources and constraints.

	05.06 Evaluate design based on current industry and Open Web Application Security Project (OWASP) standards.
	05.07 Create site navigation plan including directory structure.
	05.08 Procure/create and incorporate standard and animated graphics into a webpage.
	05.09 Design page templates to implement on final site.
	05.10 Create a webpage using authoring tools.
	05.11 Code page(s) using current web programming languages.
	05.12 Check page for cross-browser capability and other access issues.
	05.13 Upload pages and run site analysis.
	05.14 Incorporate multimedia files into a webpage.
	05.15 Incorporate an e-mail link on a webpage.
	05.16 Incorporate internal and external links on a webpage.
	05.17 Incorporate tables and file transfer capabilities on a webpage.
	05.18 Incorporate handicapped-accessibility options into the website.
	05.19 Configure a webpage for Search Engine Optimization.
	05.20 Create a web form and produce e-mail results.
	05.21 Create a web database interface.
	05.22 Discuss the issue of ODBC compliance.
	05.23 Describe SQL Injections Concepts.
	05.24 Describe how JavaScript is used to manipulate the DOM (Document Object Model).
	05.25 Explain Cross-Site Scripting (XSS) and Cross-site request forgery (CSRF).
06.0	Perform secure programming and scripting activities. The student will be able to:
	06.01 Identify several of the most prominent current programming languages.
	06.02 Characterize the stages of the system development life cycle.
	06.03 Differentiate between various strategies for problem solving.
	06.04 Describe the program design and development process.
	06.05 Differentiate between structured programming and object-oriented programming.
	06.06 Use programming, scripting, and/or macro languages to create and test programs.

	06.07 Apply principles of good design and documentation when developing programs.
	06.08 Write scripting code to handle error checking.
	06.09 Write code to allow for interactions between the client and server.
	06.10 Use scripting languages to create dynamic webpages.
	06.11 Identify development tools.
	06.12 Design, review, and test specifications and algorithms.
	06.13 Write a program according to specifications and revise based on testing and debugging.
	06.14 Demonstrate proficient use of current scripting development languages.
	06.15 Use scripting languages to automate administration tasks.
	06.16 Describe regular expressions.
07.0	Demonstrate an understanding of Cybersecurity Foundations and Principles. The student will be able to:
	07.01 Complete a security needs evaluation.
	07.02 Design security architecture.
	07.03 Select security protocols.
	07.04 Select and set encryption methodologies.
	07.05 Incorporate password protection on a webpage.
	07.06 Incorporate session handling into a webpage.
	07.07 Configure firewall.
08.0	Demonstrate an understanding of legal, regulatory, and ethical issues related to cybersecurity. The student will be able to:
	08.01 Discuss the types of works that are protected by intellectual property laws.
	08.02 Discuss the basic elements of a contract.
	08.03 Discuss e-mail litigation, including anti-spam laws.
	08.04 Discuss e-mail use and ownership.
	08.05 Describe customer and employee privacy issues and safeguards.
	08.06 Develop examples of acceptable use policies.
	08.07 Understand organizational codes of ethics.
	08.08 Research industry standards and codes of conduct for information technology professionals.

	08.09 Write a personal code of ethics.
	08.10 Discuss regulatory cybersecurity compliance
09.0	Demonstrate effective communication and soft skills. The student will be able to:
	09.01 Write logical and clear statements, or phrases, to complete forms/invoices commonly used in business and industry.
	09.02 Read and explain graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	09.03 Deliver and follow oral and written instructions.
	09.04 Answer and ask questions coherently and concisely.
	09.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	09.06 Demonstrate appropriate communication skills.
	09.07 Prepare and deliver a technical presentation.
	09.08 Discuss verbal and nonverbal behaviors.
	09.09 Compose and critique professional documents.
	09.10 Demonstrate effective use of electronic communication.
	09.11 Summarize the skills involved in being an effective listener.
	09.12 Demonstrate ability to work and communicate effectively in multicultural and diverse environments.
10.0	Explain and apply cryptographic concepts. The student will be able to:
	10.01 Compare and contrast symmetric and asymmetric cryptography.
	10.02 Explain the purpose of hash functions.
	10.03 Explain the use of cryptography for authentication purposes.
	10.04 Describe the goals of digital certificates.
	10.05 Explain the use of digital signatures.
	10.06 Classify common cryptographic standards.
	10.07 Explain the purpose, security requirements, and properties of hash functions and the use of common hash function algorithms.
11.0	Demonstrate an understanding of secure database concepts. The student will be able to:
	11.01 Understand secure database concepts.
	11.02 Explain conceptual design principles.
	11.03 Demonstrate the ability to create a database design.

11.04	Demonstrate the ability to create, maintain, and delete tables, sequences, and indexes.
11.05	Demonstrate the ability to query the database and optimize information retrieval.
11.06	Discuss best practices to secure databases.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

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- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

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Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Cybersecurity Analyst (0511100314) -- 24 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Internet Services Technology**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511100400
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as Internet/Intranet Technicians, Web Technicians, Internet/Intranet Administrators, Web Administrators, Internet/Intranet Developers, Internet/Intranet Masters, Web Masters, Internet support specialists, Web page designers, Web database administrators, Internet managers, Web technicians, Web site developers, Web managers, or Web architects in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to work in Internet, Intranet, and Extranet environments; installing, configuring, designing and managing Intranet and web-based resources

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.

- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

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Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
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01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency with Internet structure, organization, and navigation.
02.0 Demonstrate understanding of networked environments, hardware and software.
03.0 Perform server installation and configuration activities.
04.0 Understand, install and configure computer hardware.
05.0 Understand, install and configure computer software.
06.0 Perform enterprise architecture-related tasks.
07.0 Perform web design/development activities.
08.0 Perform programming and scripting activities.
09.0 Perform testing/troubleshooting activities.
10.0 Perform security activities.
11.0 Perform website management activities.
12.0 Perform e-commerce-related tasks.
13.0 Perform quantitative analysis activities.
14.0 Demonstrate professional development skills.
15.0 Perform Documentation and Technical reference activities.
16.0 Demonstrate employability skills.
17.0 Perform general organizational computing workplace competencies.

Florida Department of Education
Student Performance Standards

Program Title: **Internet Services Technology**
CIP Number: **1511100400**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency with Internet structure, organization, and navigation. The student will be able to:
01.01	Describe the origin of the Internet.
01.02	Outline the history of the Internet.
01.03	Describe Internet organization, such as the Internic, domains and requests for comments (RFCs).
01.04	Describe the structure of the Internet.
01.05	Differentiate between the Internet and the WWW.
01.06	Define Internet push technologies, such as e-mail marketing vs. webpage banner advertising.
01.07	Differentiate among an Intranet site, an extranet site, and an Internet site.
01.08	Describe and identify several major ethical and legal issues related to Internet use and how they affect intellectual property rights.
01.09	Describe the World Wide Web (WWW) and identify how it affects personal security and privacy and our society.
01.10	Describe and differentiate between file types and protocols.
01.11	Demonstrate the use of typical remote access mechanisms.
01.12	Describe various sections of a URL.
01.13	Discuss the use of Internet tools and utilities.
02.0	Demonstrate understanding of networked environments, hardware, and software. The student will be able to:
02.01	Give several advantages and disadvantages of networked and non-networked environments.
02.02	Describe current network environments and network topologies.
02.03	Identify and discuss issues such as security, privacy and redundancy related to networked environments.
02.04	Identify and discuss standardization issues related to naming conventions.
02.05	List and define layers in the OSI and TCP/IP network protocol models.
02.06	Identify and describe current relevant IEEE standards.
02.07	Discuss the nature of IP and MAC addressing.

	02.08 Describe the major functions and requirements of web-based server and client hardware and software components.
	02.09 Identify a variety of specialized servers.
	02.10 Recognize and describe current cable technologies.
	02.11 Describe current wireless technologies.
	02.12 Describe the major functions of network connectivity hardware, such as hubs, repeaters, bridges, routers, switches, and gateways.
	02.13 Describe the hardware needed to connect a LAN to the Internet.
	02.14 Describe the function of network storage devices and other peripherals.
	02.15 Compare and contrast major functions and features of current network operating systems (including directory services).
	02.16 Differentiate between telecommunications and data communications.
	02.17 Compare and contrast digital communications lines and cable characteristics (e.g., ISDN, DSL, T-1, T-3).
03.0	Perform server installation and configuration activities. The student will be able to:
	03.01 Evaluate, install and configure software for webpage authoring.
	03.02 Install and configure drivers for NICs and network peripherals.
	03.03 Configure protocol stacks.
	03.04 Configure a server for multiple network protocols and frame types.
	03.05 Configure a server to handle multiple languages for international applications.
	03.06 Install and configure an Internet web server.
	03.07 Install, configure and set up a proxy server and a gateway.
	03.08 Set up a server for remote access.
	03.09 Address security issues raised by the ability to access server remotely.
	03.10 Discuss the functions of authentication servers, RADIUS, and VPN.
	03.11 Configure e-commerce server and database.
	03.12 Install and configure servers for communications.
	03.13 Plan, test, and integrate server components.
04.0	Understand, install and configure computer hardware. The student will be able to:
	04.01 Explain the use of binary numbers to represent instructions and data.
	04.02 Describe the hardware implications of the use of binary representation of instructions and data.

	04.03	Convert numbers among decimal, binary, and hexadecimal representation.
	04.04	Perform binary arithmetic.
	04.05	Identify various data representation schemes (e.g., ASCII, Unicode).
	04.06	Discuss various data types such as signed and unsigned integers and floating point.
	04.07	Identify the major hardware platforms.
	04.08	Describe distinguishing features of the major hardware platforms.
	04.09	Describe the functions of major hardware components of a computer system.
	04.10	Recognize and correctly identify computing hardware components.
	04.11	Describe emerging hardware technologies and discuss their potential impact.
	04.12	Implement proper procedures for handling and safeguarding equipment.
	04.13	Perform preventive maintenance tasks on microcomputer systems.
	04.14	Describe procedures for proper disposal of computer components.
	04.15	Set up and configure systems and peripherals.
	04.16	Set up BIOS.
	04.17	Install and configure storage and I/O device interfaces.
	04.18	Install and configure multimedia devices and interfaces.
	04.19	Install and configure network interface cards.
05.0	Understand, install and configure computer software. The student will be able to:	
	05.01	Describe the functions and major components (e.g., BIOS and task management) of a computer operating system.
	05.02	Identify current operating systems and describe their important features.
	05.03	Use an operating system for activities such as data and file management.
	05.04	Identify current systems utilities and describe their functions.
	05.05	Use system software to perform routine maintenance tasks such as backup, and hard drive defragmentation.
	05.06	Use both stand-alone operating systems and network operating systems on different platforms.
	05.07	Create, use, and maintain system configuration files.
	05.08	Describe and use popular features and functions of the major categories of applications software (e.g., word processing, database, spreadsheet, presentation, email, browsers).
	05.09	Use software produced by multiple vendors.

	05.10	Transmit and exchange data in a multiple vendor software environment.
	05.11	Install and configure operating systems on multiple platforms.
	05.12	Describe procedures for uninstalling operating system software.
	05.13	Install and configure system software.
	05.14	Install, configure and upgrade applications software.
	05.15	Configure software for accessibility by disabled individuals.
	05.16	Describe conflict handling when installing, configuring and upgrading applications software.
	05.17	Install and configure client software for connecting to LANs, WANs, and the Internet.
	05.18	Install and configure client software for client/server and network-based applications (e.g., e-mail, videoconferencing, database).
	05.19	Install internetworking applications on a server and configure clients for network access.
	05.20	Describe the major functions of network client software components.
	05.21	Install and configure client software on multiple hardware platforms.
	05.22	Install and configure drivers for NICs and network peripherals (including printers).
	05.23	Configure the client to support multiple protocols.
	05.24	Install and configure network-based services such as videoconferencing, integrated voicemail/email/fax, large document storage and retrieval.
06.0	Perform enterprise architecture-related tasks. The student will be able to:	
	06.01	Describe the Human-Computer Interaction (HCI) factors that impact the design of a webpage and website.
	06.02	Determine the purpose of establishing a website.
	06.03	Identify the intended audience that will access a website.
	06.04	Determine user needs including secondary applications including database needs and select appropriate applications.
	06.05	Identify business processes to be automated.
	06.06	Determine client specifications.
	06.07	Determine design standards based on intended audience.
	06.08	Define architecture specifications taking into account constraints (e.g., bandwidth).
	06.09	Establish performance standards and set baseline.
	06.10	Determine security standards that will meet business requirements.
	06.11	Install and configure system based on planning.

07.0	Perform web design/development activities. The student will be able to:
07.01	Describe and use the process of storyboarding a website.
07.02	Describe format, structure and design principles for websites.
07.03	Evaluate web graphic utilities and creation tools, including those for animated graphics.
07.04	Identify existing resources and constraints.
07.05	Evaluate design based on current industry and in-house standards.
07.06	Create site navigation plan including directory structure.
07.07	Procure/create and incorporate standard and animated graphics into a webpage.
07.08	Obtain in-house content and determine needs for secondary content providers.
07.09	Design page templates to implement on final site.
07.10	Create a webpage using authoring tools.
07.11	Code page(s) using current web programming languages.
07.12	Check page for cross-browser capability and other access issues.
07.13	Upload pages and run site analysis.
07.14	Incorporate sound files onto a webpage.
07.15	Incorporate a streaming video file onto a webpage.
07.16	Incorporate a video file for download into a webpage.
07.17	Create an animated graphic.
07.18	Perform simple graphic modifications using a graphics utility.
07.19	Incorporate an e-mail link on a webpage.
07.20	Incorporate internal and external links on a webpage.
07.21	Incorporate tables and file transfer capabilities on a webpage.
07.22	Incorporate handicapped-accessibility options into the website.
07.23	Configure a webpage for Search Engine Optimization.
07.24	Create a web form and produce e-mail results.
07.25	Create a web database interface.
07.26	Discuss the issue of ODBC compliance.

08.0	Perform programming and scripting activities. The student will be able to:
08.01	Identify several of the most prominent current programming languages.
08.02	Characterize the stages of the system development life cycle.
08.03	Differentiate between two common strategies for problem solving.
08.04	Describe the program design and development process.
08.05	Differentiate between structured programming and object-oriented programming.
08.06	Use procedural and object-oriented constructs of programming, scripting, and/or macro languages to create and test programs.
08.07	Apply principles of good design and documentation when developing programs.
08.08	Write scripting code to handle error checking in client forms.
08.09	Write CGI programs to allow for interactions between the client and server.
08.10	Use scripting languages to create dynamic webpages.
08.11	Identify development tools and list in order of complexity of use.
08.12	Design, review, and test specifications and algorithms.
08.13	Write program according to specifications and revise based on testing and debugging.
09.0	Perform testing/troubleshooting activities. The student will be able to:
09.01	Describe the use of diagnostic test equipment.
09.02	Describe features of diagnostic software.
09.03	Use system, software, and network documentation.
09.04	Locate and use online documentation resources.
09.05	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
09.06	Recognize and resolve basic hardware, software configuration, and peripheral device problems.
09.07	Use effective troubleshooting strategies and techniques to resolve network problems, including network interfaces, cabling, or other network components (hubs, switches).
09.08	Describe appropriate procedures and techniques for disaster prevention and recovery (surge suppressors, UPS, use of anti-virus software, replacement equipment plans, backups of software and data, offsite storage of backup media).
09.09	Describe appropriate security procedures and practices, including physical security and protection of resources through software measures (passwords, antivirus software, data encryption).
09.10	Develop testing plan and procedures.
09.11	Develop a system baseline.

	09.12 Perform capacity testing against system baseline.
	09.13 Evaluate network, database and server performance based on test outcomes.
	09.14 Evaluate client performance based on test outcomes.
	09.15 Assess accessibility standards.
	09.16 Evaluate security system.
	09.17 Conduct ongoing systems analysis and revise system as needed.
	09.18 Discuss obtaining final client approval for implementation and system changes.
10.0	Perform security activities. The student will be able to:
	10.01 Complete a security needs evaluation.
	10.02 Design security architecture.
	10.03 Select security protocol.
	10.04 Select and set encryption methodology.
	10.05 Incorporate password protection on a webpage.
	10.06 Incorporate session handling into a webpage.
	10.07 Configure firewall.
11.0	Perform website management activities. The student will be able to:
	11.01 Describe the process of obtaining a domain address.
	11.02 Notify appropriate external search engines of the website.
	11.03 Compare features of currently available site management tools.
	11.04 Install and configure website management software.
	11.05 Create and maintain a website using a web management tool.
	11.06 Implement appropriate website security measures.
	11.07 Use and evaluate the results of a website visit-recording tool.
12.0	Perform e-commerce-related tasks. The student will be able to:
	12.01 Describe web e-commerce.
	12.02 Analyze e-commerce models.
	12.03 Develop e-commerce business and marketing plan.

	12.04 Identify components and procedures necessary to process credit card transactions including any security measures.
	12.05 Demonstrate an understanding of the credit card transaction process.
	12.06 Implement shopping cart software.
	12.07 Set up and configure online catalog to market products.
	12.08 Establish transaction storage and reporting system.
	12.09 Publish website.
13.0	Perform quantitative analysis activities. The student will be able to:
	13.01 Determine type/tools available for analysis.
	13.02 Determine traffic patterns.
	13.03 Gather and analyze user data.
	13.04 Make recommendations for site improvements.
14.0	Demonstrate professional development skills. The student will be able to:
	14.01 Identify corporate strategies and policies.
	14.02 Maintain professional contact for future projects.
	14.03 Build mentor relationships.
	14.04 Anticipate future industry trends.
	14.05 Utilize life-long learning skills.
	14.06 Review and analyze other industry productions.
	14.07 Use and experiment with the technology.
	14.08 Network with local professionals in the industry.
	14.09 Read industry journals and magazines.
	14.10 Attend seminars, workshops, and tradeshows.
15.0	Perform Documentation and Technical reference activities. The student will be able to:
	15.01 Use technical vocabulary appropriately.
	15.02 Locate information in technical references.
	15.03 Prepare technical reports.
	15.04 Describe appropriate documentation procedures and practices.

	15.05 Effectively use locally maintained systems, software, and network documentation.
	15.06 Produce and maintain system documentation, such as inventory, costs, installed software, and procedures.
	15.07 Demonstrate proficiency with Internet structure, organization, and navigation.
	15.08 Maintain visual network documentation, such as cabling diagrams.
	15.09 Describe effective strategies to locate and evaluate technical information online.
	15.10 Cite correctly Internet-based resources.
16.0	Demonstrate employment skills. The student will be able to:
	16.01 Identify appropriate attire and grooming for a business office.
	16.02 Identify sources of employment opportunities.
	16.03 Discuss employer expectations regarding attendance, punctuality, initiative and teamwork.
	16.04 Discuss employee rights regarding privacy, discrimination, due process and safety.
	16.05 Explain the importance of having a written job description.
	16.06 List representative jobs and career paths for people trained in the computer networking support area.
	16.07 List several functions of each representative computer service oriented job and career path.
	16.08 Complete employment forms.
	16.09 Classify behaviors considered to be appropriate or inappropriate in a job interview situation.
	16.10 Compose and type a follow-up letter.
	16.11 Compose and type a letter of application and a resume.
	16.12 Compose and type a letter of resignation.
	16.13 Demonstrate job interview skills.
	16.14 Identify methods for securing an employment reference.
17.0	Perform general organizational computing workplace competencies. The student will be able to:
	17.01 Follow oral and written instructions.
	17.02 Prepare, outline, and deliver a short oral presentation, including visual aids.
	17.03 Participate in group discussion as a member and as a leader.
	17.04 Obtain appropriate information from graphics, maps, or signs.
	17.05 Demonstrate self-motivation and responsibility to complete an assigned task.

17.06	List the steps in solving a problem.
17.07	Choose appropriate action in situations requiring effective time management.
17.08	Identify and discuss issues contained within professional codes of conduct.
17.09	Identify and discuss property rights and licensing issues.
17.10	Identify and discuss privacy issues.
17.11	Identify and discuss encryption issues.
17.12	Identify legal liability issues.
17.13	Describe appropriate measures for planning and managing a large project.
17.14	Define an implementation schedule for a large project.
17.15	Describe appropriate measures for planning and implementing corporate wide upgrade of hardware and software.
17.16	Identify potential sources of employee/employer or employee/employer conflict and discuss possible approaches to resolve such disagreements.
17.17	Use appropriate communication skills, courtesy, manners, and dress in the workplace.
17.18	Apply principles and techniques for being a productive, contributing member of a team.
17.19	Identify and use acceptable strategies for resolving conflict in the workplace.
17.20	Apply principles and techniques for working productively with people of diverse cultures and backgrounds.
17.21	Identify techniques for stress management and prevention of job burn-out.
17.22	Use appropriate communication skills, telephone etiquette, courtesy, and manners when dealing with customers.
17.23	Communicate effectively with individuals lacking a technical background.
17.24	Identify examples of effective end-user training strategies and techniques.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030 (4) F.A.C. identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science degree and the Associate of Applied Science degree. In addition, Rule 6A-14.0303 FAC implements section 1007.25 Florida Statutes and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Information Technology Administration (0511010307) – 18 credit hours
Web Development Specialist (0511080103) – 35 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Technology Project Management**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1511100509
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as project managers and professionals incorporating IT project management strategies in their business activities in the Information Technology career cluster; provides technical skill proficiency, and competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to balance of business and technology components and allows the student to gain additional skills in the area of Project Management.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:

- Related CCC and ATD credentials.
- Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstration in, and implementation of the main areas of information technology.
02.0 Interactive IT tools covering media, graphics, communications, word processing, spreadsheets, and presentation software skills.
03.0 Information Technology activities.
04.0 Project costs and budgeting.
05.0 Human resources management activities.
06.0 Fundamentals of project management.
07.0 Full project life cycle and various project management processes.
08.0 Define stakeholder expectations and initiate a project successfully.
09.0 Create a comprehensive project plan.
10.0 Work in teams, manage team members, and interact with stakeholders.
11.0 Plan and monitor project budget and schedule.
12.0 Basic tools and techniques of managing project quality and risk.
13.0 Principles of identifying, developing, and managing resources.
14.0 Navigating a project experiencing scope, resource, and scheduling constraints through effective communication.
15.0 Technical and human aspects of project control, with a focus on change control.
16.0 Contextual relationship between the project and the organization that hosts the project.
17.0 Ethical considerations in every aspect of a project's operations.
18.0 Employability skills.
19.0 Communications skills.

Florida Department of Education
Student Performance Standards

Program Title: **Technology Project Management**
CIP Number: **1511100509**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstration in, and implementation of the main areas of information technology. The student will be able to:
01.01	Identify, use and connect hardware components and devices.
01.02	Demonstrate the proper use and maintenance of PC hardware.
01.03	Install & configure laptops and other mobile devices.
01.04	Explain types of networks and connections including TCP/IP, WIFI and SOHO.
01.05	Troubleshoot device and network issues.
01.06	Identify and protect against security vulnerabilities for devices and their network connections.
01.07	Install and support Windows OS.
01.08	Understand Mac OS, Linux and mobile OS.
01.09	Follow best practices for safety, environmental impacts, and communication and professionalism.
02.0	Interactive IT tools covering media, graphics, communications, word processing, spreadsheets, and presentation software skills. The student will be able to:
02.01	Describe various interactive media tools and define their purpose and function.
02.02	Demonstrate knowledge in opening, running and/or creating video clips and sound clips.
02.03	Demonstrate knowledge of word processing software to create and modify documents in a collaborative environment.
02.04	Demonstrate knowledge of spreadsheet software to create and modify workbooks to manipulate and analyze data.
02.05	Demonstrate knowledge of presentation software to create and modify interactive presentations.
02.06	Demonstrate the ability to work in an electronic collaborative environment.
02.07	Demonstrate proficiency with project management software.
03.0	Information Technology activities. The student will be able to:
03.01	Discuss common applications of computers and information systems.
03.02	Define a computer system, and describe its components.

	03.03 Define a database and a database management system.
	03.04 Discuss the legal and ethical issues related to information technology.
	03.05 Discuss issues related to IS security crimes.
	03.06 Explain important networking concepts and applications of a data communication system.
	03.07 Explore the systems development life cycle (SDLC) as a method for developing information systems.
	03.08 Describe new trends in software, networking, virtualization and cloud computing.
04.0	Project Costs and Budgeting. The student will be able to:
	04.01 Demonstrate an understanding of the basic accounting principles and practices.
	04.02 Demonstrate an understanding of budgeting.
	04.03 Demonstrate an understanding of costing.
	04.04 Identify fundamental financial analysis concepts.
	04.05 Describe financial analysis tools.
	04.06 Understand and interpret financial reports.
05.0	Human resources management activities. The student will be able to:
	05.01 Describe the importance of human resources.
	05.02 Describe the components of the job requirement and analysis process.
	05.03 Describe the important elements of effective human resource planning.
	05.04 Apply leadership techniques and defend the use of appropriate practices for motivating teams and developing leadership abilities.
06.0	Fundamentals of project management. The student will be able to:
	06.01 Describe the importance of PM in the context of various organizational cultures and strategies, and summarize the typical components of the PM system and the processes that are considered essential to any project.
	06.02 Select and describe an appropriate PM strategy for a new project that can meet stakeholder expectations in a given organizational context.
07.0	Full project life cycle and various project management processes. The student will be able to:
	07.01 List and describe the project phases that make up a typical project, and summarize PM processes that occur within each.
	07.02 Describe the typical PM process documentation and PM deliverables that are produced by project managers in each project phase.
08.0	Define stakeholder expectations and initiate a project successfully. The student will be able to:
	08.01 Given an organizational context, project objectives, and recommended strategy, develop a sequence of categorized PM processes and activities that will meet stakeholder expectations.

	08.02 Create, or identify, a project charter and its primary components, including writing a concise statement of business needs that the project will address.
09.0	Create a comprehensive project plan. The student will be able to:
	09.01 Develop a PM plan that documents the actions necessary to define, coordinate, and measure all project activities, and to ensure control and management of costs and changes to the project.
	09.02 Describe the components of the project plan and the interactions of the various processes of the project plan with other processes in the PM system.
10.0	Work in teams, manage team members, and interact with stakeholders. The student will be able to:
	10.01 Select appropriate communication tools and methods to communicate with identified stakeholders, including commonly used templates for communication activities such as status reporting, issues tracking, change control, and project reviews.
	10.02 Understand sources of conflict and, given a specific challenge, apply a problem-solving process that focuses on confronting and resolving the problem.
11.0	Plan and monitor project budget and schedule. The student will be able to:
	11.01 Identify necessary labor and material resources, including contracted resources, and estimate how many units of each are required to meet project expectations.
	11.02 Describe the fundamental types of time- and cost-estimating approaches and how these are best related to the time line of the project, becoming more specific as more information is known about project requirements, risks, and activities.
12.0	Basic tools and techniques of managing project quality and risk. The student will be able to:
	12.01 Given a specific project context and plan, identify potential project risks and/or opportunities, evaluate each according to criteria for impact on the project, and document them in a prioritized risk register.
	12.02 Demonstrate knowledge of the core quality processes and explain the role of each process in planning and managing projects.
13.0	Principles of identifying, developing, and managing resources. The student will be able to:
	13.01 Demonstrate how teams are assigned and formed, and describe the stages of team development.
	13.02 Enhance team capability after assessing personal strengths and weaknesses, and develop skills to manage a team and lead others.
14.0	Navigating a project experiencing scope, resource, and scheduling constraints through effective communication. The student will be able to:
	14.01 Demonstrate ability to optimize the project schedule by allocating resources to the critical path.
	14.02 Demonstrate ability to optimize schedules to maximize efficiency.
15.0	Technical and human aspects of project control, with a focus on change control. The student will be able to:
	15.01 Demonstrate knowledge of how changes to project scope may affect the project's schedule, cost, and quality, and how to evaluate the impact and recommend a solution that produces the desired project product.
	15.02 Describe how to monitor and control variances as they pertain to project cost, schedule, scope, and quality, and how to formally communicate such variances to the stakeholder.
16.0	Contextual relationship between the project and the organization that hosts the project. The student will be able to:

	16.01 Describe how to manage a project in a matrix organizational structure, and illustrate how to successfully deliver a project when the PM might not be sufficiently empowered.
	16.02 Demonstrate knowledge of key linkages between organizational and project-level issues, including decision making, motivation, and project roles.
	16.03 Demonstrate knowledge and skills in procurement, supply-chain management, finance, cost management, and other business aspects of projects.
17.0	Ethical considerations in every aspect of a project's operations. The student will be able to:
	17.01 Given a case study scenario involving ethical considerations, demonstrate how a project can be executed according to the standards of the organization hosting the project.
	17.02 Demonstrate knowledge of situations involving unethical project activities, and best practices for whistle blowing and ethical decision making.
18.0	Employability skills. The student will be able to:
	18.01 Conduct a job search.
	18.02 Secure information about a job.
	18.03 List and obtain documents that may be required when applying for a job and preparing for an interview.
	18.04 Complete a job application form.
	18.05 Demonstrate competence in job interview techniques.
	18.06 Identify or demonstrate appropriate responses to criticism.
	18.07 Identify and describe acceptable work habits.
	18.08 Demonstrate knowledge of how to make appropriate job changes during the course of a career.
19.0	Communications skills. The student will be able to:
	19.01 Write logical and clear statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	19.02 Read and explain graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	19.03 Deliver and follow oral and written instructions.
	19.04 Answer and ask questions coherently and concisely.
	19.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	19.06 Demonstrate appropriate communication skills.
	19.07 Prepare and deliver a technical presentation.
	19.08 Observe and interpret verbal and nonverbal behavior.
	19.09 Compose and critique business documents, memorandums, business letters, requests, answer requests, claims/adjustments, and letters using correct English grammar and punctuation.

19.10	Demonstrate effective use of electronic communication.
19.11	Summarize the skills involved in being an effective listener.
19.12	Demonstrate ability to work and communicate effectively in multicultural and diverse environments.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Project Management Associate (0511100501) -- 12 credit hours
Technology Project Manager (0511100502) -- 24 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Data Science Technology**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1530700100
Program Type	College Credit
Program Length	60 credit hours
CTSO	BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to in-depth instruction on activities performed in the acquisition of data in structured and unstructured formats, cleaning, modeling, and analysis of acquired data, and extraction of knowledge or insights using statistical processes and systems. Additional content includes identification of data sources, retrieval issues and methodologies, data security, data ethics, and the use of other informational tools.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.

- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Describe the data life cycle.
02.0 Describe basic statistical concepts and apply statistical methods used in data science problems.
03.0 Describe selection, collection, preprocessing, and transformation processes used with data sources.
04.0 Describe modelling, analysis, and visualization techniques applied to acquired data.
05.0 Describe security best practices for each phase of acquisition, analysis, and retention of data.
06.0 Describe ethical best practices related to each phase of the data life cycle.

Florida Department of Education
Student Performance Standards

Program Title: **Data Science Technology**
CIP Number: **1530700100**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Describe the data life cycle. The student will be able to:
01.01	Describe ways in which data can be acquired:
•	Describe data sources and methods for acquiring data.
•	Describe how data is captured (i.e., from control systems devices or Internet of things devices, etc.).
•	Describe how acquired data is cleaned and transformed.
01.02	Describe techniques for analyzing data:
•	Describe data models.
•	Describe techniques used for data visualization.
•	Describe statistical methods that are applied to data to extract useful information.
•	Describe the process of Exploratory Data Analysis.
01.03	Describe how data analysis results can be reported.
•	Describe dashboards and how they can be used to make business decisions.
•	Determine appropriate reporting formats.
02.0	Describe basic statistical concepts and apply statistical methods used in data science problems. The student will be able to:
02.01	Describe the difference between population and sample data.
02.02	Construct frequency distributions.
02.03	Use descriptive statistical methods to analyze sets of data.
02.04	Use probability rules to solve probability problems.
02.05	Solve problems involving discrete probability distributions including the binomial probability distribution.
02.06	Construct confidence intervals from sample data.
02.07	Conduct tests of hypotheses with one and two samples.
02.08	Use correlation and linear regression methods to analyze data.

03.0	Describe selection, collection, preprocessing, and transformation processes used with data sources. The student will be able to:
03.01	Describe criteria and procedures used for data selection.
03.02	Compare attributes and benefits of data sources and associated collection strategies including:
•	Structured and unstructured data.
•	RDBMS (Relational Database Management Systems).
•	Data warehouses and OLAP (Online Analytical Processing) Cubes.
•	Spreadsheets.
•	Data Serialization Languages, e.g., XML (eXtensible Markup Language), JSON (JavaScript Object Notation), YAML (Yet Another Markup Language, or "YAML Ain't Markup Language")
•	CSV (Comma Separated Values) data.
•	Web data.
•	GIS (Geographical Information Systems) data.
•	Raw data.
03.03	Describe and utilize data preprocessing and normalization:
•	Describe and apply common techniques for cleaning textual, numeric, and categorical data.
•	Describe the use of probabilistic methods and decision trees for classification.
•	Describe the use and applicability of transformations used to normalize data distributions.
03.04	Describe OLTP (Online Transaction Processing) design concepts and principals.
03.05	Use data processing tools (e.g., SAS, PowerBI, Tableau, etc.) or programming languages (e.g., Python, R, Java, etc. and associated libraries) to collect and clean data from various sources.
03.06	Create a data warehouse:
•	Design an OLAP database using dimensional modeling techniques.
•	Create a data warehouse based on OLAP design.
•	Create an ETL (Extract/Transfer/Load) process to populate and update the data warehouse from OLTP database utilizing SQL Server Integration (SSIS).
04.0	Describe modelling, analysis, and visualization techniques applied to acquired data. The student will be able to:
04.01	Describe and apply the use of linear regression and decision trees in data modeling.
04.02	Develop data cubes utilizing SQL Server Reporting Services (SSRS).
04.03	Use statistical tools (e.g., SAS, SPSS, etc.) or programming languages (e.g., R, Python, etc. with associated libraries) to solve various statistical problems:

		• Calculate summary statistics.
		• Calculate correlation values.
		• Construct confidence intervals from sample data.
		• Conduct tests of hypotheses with one and two samples.
		• Analyze data using correlation and linear regression methods.
	04.04	Describe the advantages of large-scale data analysis tools (e.g., Apache Hadoop, Apache Spark, Google BigQuery, Data Torrent RTS, etc.) for solving data science problems.
	04.05	Create graphical representations of data models and analysis results using data visualization tools (e.g., Tableau, PowerBI, SAS, etc.) or programming languages (e.g., R, JavaScript, Python, Java, etc. with associated libraries).
	04.06	Develop dashboards utilizing reporting tools (e.g., SharePoint, Tableau, PowerBI, etc.).
05.0	Describe security best practices for each phase of acquisition, analysis, and retention of data. The student will be able to:	
	05.01	Describe basic security principles including the CIA Triad, general security concepts, communication security, confidentiality, authentication and other cryptography concepts, and operational and organizational security.
	05.02	Describe risks associated with data privacy and integrity.
	05.03	Describe basic web security.
	05.04	Describe security methodologies as they relate to data protection and availability.
06.0	Describe ethical best practices related to each phase of the data life cycle. The student will be able to:	
	06.01	Describe various professional organization ethics guidelines that can be applied to data science.
	06.02	Identify stakeholders in ethical reasoning scenarios.
	06.03	Describe scenarios where professional organization ethics guidelines can apply to each phase of the data lifecycle.
	06.04	Describe how ethical reasoning can be applied to support decision making in various scenarios.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Data Science Technician (0530700100) – 36 credit hours
FinTech Technician (0530710400) – 33 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Business Intelligence Specialist (Data Science Technician)**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1530700101
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL, BPA
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to in-depth instruction on the activities performed data analysis; factors, issues, and constraints relating to the creation of reports; requirements for documenting specifications; identifying data sources and retrieval issues and methodologies; report delivery mechanisms; report modification and maintenance; data governance; quality control tests; data and report integrity; and the use of data science tools.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.'

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.

- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Define and describe the process of data analysis.
02.0 Describe the concepts of data science and how they are applied to data analysis.
03.0 Describe the implications of business intelligence analysis on an organization's strategic marketing, organizational, and business plans.
04.0 Provide standard report specifications and generate standard or custom reports that summarize business, financial, or economic data for review by stakeholders.
05.0 Describe security concerns associated with Data Science.
06.0 Define and differentiate among data constraints, filters, exception threshold, and data organization factors important in the creation of a report.
07.0 Locate, acquire, and model the data for analysis and output.
08.0 Compare and contrast the various forms for report presentation.
09.0 Describe the advantages and disadvantages for various report delivery mechanisms.
10.0 Reassess current business intelligence or trend data in support of altered information needs.
11.0 Analyze technology trends to identify markets for future product development or to improve sales of existing products.
12.0 Conduct or coordinate tests to ensure data analysis is consistent with defined needs.
13.0 Formulate and/or adhere to data governance policies and processes.
14.0 Identify and analyze industry or geographic trends with business strategy implications.
15.0 Describe best practices for change management to ensure data and report integrity and continuity.
16.0 Apply quality control standards and measures.
17.0 Compare and contrast the attributes and appropriateness of data analysis tools.
18.0 Describe the transformation and statistical functions used in Data Science.

Florida Department of Education
Student Performance Standards

Program Title: **Business Intelligence Specialist**
CIP Number: **1530700101**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Define and describe the process of data analysis. The student will be able to:
01.01	Describe the requirements of analysis planning.
•	Define the goals of the desired requirements.
•	Select an appropriate analysis strategy.
01.02	Describe the activities and goals of the design phase.
•	Determine appropriate reporting format.
•	Select appropriate reporting tool/form.
•	Describe appropriate delivery mechanism.
•	Define data criteria and constraints.
•	Delineate report data definitions.
01.03	Describe the activities and goals of the development phase.
•	Identify available data sources and formats.
•	Acquire data.
•	Analyze data.
•	Create report.
01.04	Describe the activities and goals of the evaluation phase.
•	Define analytics/metrics suitable for evaluating accuracy and validity of results.
•	Evaluate report output to assess whether intelligence is consistent with defined goals.
•	Assess report performance and usability.
01.05	Describe the activities and goals of the deployment and maintenance phase.
•	Perform data reconciliation.
•	Conduct periodic validation of reports with appropriate audiences and end-users.

	• Track daily/weekly/monthly usage of data/reports.
	• Determine proper “phasing out” thresholds for existing reports based on usage, data validity, and report reliability.
	• Determine proper data archiving thresholds.
02.0	Describe the concepts of data science and how they are applied to data analysis. The student will be able to:
02.01	Define the role of data analysis in the decision-making process.
02.02	Describe the domains of application of data science.
02.03	Describe the sources of data and information used in the analysis of data.
02.04	Describe the role and significance of data modeling, data warehousing, and data mining in data science.
02.05	Describe the risks associated with data analysis (e.g., data validity, integrity, inappropriate analytics/metrics).
03.0	Describe the implications of business intelligence analysis on an organization’s strategic marketing, organizational, and business plans. The student will be able to:
03.01	Explain how business intelligence is used in creating, validating, and strengthening an organization’s strategic marketing plan.
03.02	Explain how an organization’s internal processes, infrastructure, processes, and communication are impacted by the deployment of business intelligence.
03.03	Explain how data science is used to facilitate an organization’s decision-making process.
04.0	Provide standard report specifications and generate standard or custom reports that summarize business, financial, or economic data for review by stakeholders. The student will be able to:
04.01	Compare attributes and benefits of available data sources.
	• RDBMS.
	• Data warehouse and OLAP Cubes.
	• Spreadsheet.
	• XML.
	• CSV.
	• Web service.
	• Raw Data and other (KML/Shape).
04.02	Define report data elements/requirements (metadata).
	• Dimensions.
	• Type I (As is – current).
	• Type II (Historical – slowly changing).

	• Facts.
	• Base.
	• Summaries.
	• Calculated fields.
	• Periodicity.
	• Relationships/JOINs.
04.03	Describe how data is to be used.
	• Data mining.
	• Filtering.
	• Exception threshold alerts.
	• Aggregating.
	• Snapshot.
	• Dynamic.
	• Historical/archive/disposal.
04.04	Determine the form of analysis.
	• Comparative analysis.
	• Impact analysis.
	• Correlational (affinity) analysis.
	• Trending/Forecasting.
05.0	Describe security concerns associated with Data Science. The student will be able to:
05.01	Security Event and Event Management (SIEM).
05.02	Threat detection and mitigation.
05.03	Computer and network forensics.
05.04	Security metrics.
05.05	Fraud and loss analytics.
05.06	Analysis of market.
05.07	Risk measurement.

	05.08 Challenges.
	05.09 Applications.
06.0	Define and differentiate among data constraints, filters, exception threshold, and data organization factors important in the creation of a report. The student will be able to:
	06.01 Distinguish between data constraints and filters and their appropriate use.
	06.02 Describe how each of the following data constraints relates to the creation and/or delivery of a report.
	• Size of recordset (scope & performance).
	• Time/period (end points and span).
	• Range (e.g., # of records).
	• Data element (e.g., type, size).
	• Localization (programming & display language).
	06.03 Describe how each of the following types of filters may be used to refine or enhance a report.
	• Dimensions (Type I and Type II).
	• Facts (e.g., base, summaries, calculated fields).
	06.04 Illustrate how the use of an exception threshold contributes to the operational effectiveness of a report.
	• Display or action dependent on threshold.
	• Triggers alert or advance warning of approaching static threshold.
	• Highlights results exceeding dynamic threshold.
	06.05 Compare and contrast the following forms of data organization in terms of representation and analysis of data results.
	• GROUP BY.
	• ORDER BY (SORT).
	• Concatenation/substring.
	• KRAN.
07.0	Locate, acquire, and model the data for analysis and output. The student will be able to:
	07.01 Identify the types of data that might be used to create business intelligence reports in support of the organization's business and financial strategic goals.
	• Inventory repositories.
	• Sales data.
	• Customer data.

	• Employee/staffing data.
	• Financial data.
	• Spatial data
	• Security and Risk
	07.02 Describe the risks and potential areas of concern related to the use of external data.
	• Integrity/validity of data.
	• Legality of data availability.
	• Privacy issues of data acquired.
	• Confidentiality of acquisition.
	07.03 Describe potential issues, concerns, and obstacles associated with the use of data sources.
	• Data form.
	• Data integrity.
	• Normalization.
	• Cleaning.
	07.04 Describe the role and implications of standardization relative to internal and external data sources.
	• Describe the need for data typing and transformation.
	• Describe the methods by which transformation may be accomplished.
08.0	Compare and contrast the various forms for report presentation. The student will be able to:
	08.01 Describe the form of data required for using a report generator.
	08.02 Describe the form of data required for using a spreadsheet.
	08.03 Describe the form of data required for using a database.
	08.04 Describe the form of data required for using an OLAP Cube or hypercube.
	08.05 Describe the attributes of a report suitable for presentation in HTML/Flash.
	08.06 Describe the form of data required for using a graph.
	08.07 Describe the form of data required using a dashboard interface.
09.0	Describe the advantages and disadvantages for various report delivery mechanisms. The student will be able to:
	09.01 Email.

	09.02 Web-based.
	09.03 Mobile device.
	09.04 Intranet.
	09.05 Print/PDF.
	09.06 Oral presentation.
10.0	Reassess current business intelligence or trend data in support of altered information needs. The student will be able to:
	10.01 Identify and relate report design constraints and their relationship to data.
	10.02 Evaluate current technology in terms of compatibility and capacity for meeting new or evolving information needs.
	10.03 Re-construct report based on alternative parameters.
	10.04 Adapt and validate report based on new requirements.
11.0	Analyze technology trends to identify markets for future product development or to improve sales of existing products. The student will be able to:
	11.01 Evaluate new technologies and products for applicability, capability, and capacity for current and future information needs.
	11.02 Create a proposal for introducing new, or adapting existing, business intelligence technology, including pricing, benefits summary, cost/benefit analysis, life cycle implications, and implementation plan.
12.0	Conduct or coordinate tests to ensure data analysis is consistent with defined needs. The student will be able to:
	12.01 Evaluate that reports meet requirements.
	12.02 Test metrics for accuracy and validity.
	12.03 Peer review.
	12.04 Use performance testing.
	12.05 Use performance tuning.
13.0	Formulate and/or adhere to data governance policies and processes. The student will be able to:
	13.01 Understand how information is disseminated to end-users.
	13.02 Adhere to policies, tool use, and processes related to data governance.
14.0	Identify and analyze industry or geographic trends with business strategy implications. The student will be able to:
	14.01 Compare and contrast key performance indicators appropriate to the industry.
	14.02 Define metrics to support analysis of targeted KPIs.
	14.03 Understand how the monitoring and analysis of key performance indicators strengthen or support the organization's goals and strategies.

15.0	Describe best practices for change management to ensure data and report integrity and continuity. The student will be able to:
15.01	Authorize/permissions schema.
15.02	Use internal controls.
15.03	Impact analysis.
15.04	Use Redundancy/archival policy.
15.05	Assess readiness for change.
15.06	Communicate changes.
15.07	Separate duties (e.g., design, implementation, testing).
16.0	Apply quality control standards and measures. The student will be able to:
16.01	Check data quality.
16.02	Report quality.
16.03	Analytic/metric quality.
16.04	Check quality assurance.
17.0	Compare and contrast the attributes and appropriateness of data analysis tools. The student will be able to:
17.01	Compare and contrast enterprise-based/integrated data science tools including, but not limited to, SAS, SAP, COGNOS, Hadoop, Cloudera.
17.02	Compare and contrast native/client-based tools used in business intelligence analysis, including spreadsheets and SQL-compliant applications.
18.0	Describe the transformation and statistical functions used in Data Science. The student will be able to:
18.01	Describe and apply the programming languages used in data science.
18.02	Select an appropriate programming language and any desirable packages and apply the necessary transformation and statistical functions required to solve a problem.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Business Intelligence Professional (0552130101) – 20 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Game Development Design**
Career Cluster: **Information Technology**

Associate in Science	
CIP Number	1550041100
Program Type	College Credit
Program Length	60 credit hours
CTSO	PBL
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

Purpose

The purpose of this program is to teach students the fundamentals of Game Development as a viable career option. The program will also give students an opportunity to learn the basic knowledge in specific fields such as level designers, mobile applications developer, programming, and game designers. Coursework covers aspects of learning multiple programming languages, project management, virtual reality and augmented reality development, and multiple game engines needed for success.

The content includes but is not limited to practical experiences in virtual and augmented reality development, design, storyboarding, development methodologies, essential programming techniques, prototype development, production processes and implementation challenges. Science, Computer Programming, Math, 2D and 3D development are embedded throughout the program to emphasize the relationship between these areas and the field of Simulation and Production.

The content includes but is not limited to developing 2D and 3D games, scripting, narrative storytelling, storyboarding, basic computer animation skills, problem solving, mobile development, character design, virtual and augmented deployment, game engines, designing and implementing computer animation projects, and producing 2D/3D games in multiple game engines.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

When developing the course sequence for the local implementation of this program, select courses that:

- Meet the skill development requirements of the standards and benchmarks of this program.
- Meet the general education core course requirements of Rule 6A-14.0303, Florida Administrative Code.
- Where reasonable and practicable, align with programs offered by your institution or other postsecondary institutions in Florida, including:
    - Related CCC and ATD credentials.
    - Baccalaureate degrees within the same career pathway and/or Federal CIP code.

Visit FloridaShines' Discover Programs website to identify other institutions that offer similar programs to review their course sequencing. Where appropriate, course alignment between institutions offering related programs can facilitate interagency student articulation.

Visit FloridaShines' Common Prerequisites Manual to identify courses that are prerequisites for admission into an upper division program. When sub-baccalaureate courses are aligned to the course admissions requirements of baccalaureate programs with the same career pathway, students can enter upper division coursework seamlessly.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of the game development industry.
02.0 Identify the tools used in game development.
03.0 Describe the game development process.
04.0 Create simple 3D game environments.
05.0 Analyze the different uses of textures.
06.0 Design game levels using creation tools and editors.
07.0 Code, compile, and execute programs.
08.0 Demonstrate knowledge of object oriented programming and design concepts.
09.0 Design and develop interfaces for games.
10.0 Embed artificial intelligence (AI) methods and algorithms to create and modify games.
11.0 Evaluate artificial intelligence (AI) Path Planning.
12.0 Apply principles of stimulus-response agents.
13.0 Utilize agent architectures.
14.0 Create decision-making systems.
15.0 Apply neural networks.
16.0 Utilize genetic algorithms.
17.0 Create virtual reality environments.
18.0 Create a complete working animated game or film.
19.0 Develop VR/AR Games.
20.0 Demonstrate an understanding of Game Systems.

Florida Department of Education
Student Performance Standards

Program Title: **Game Development Design**
CIP Number: **1550041100**
Program Length: **60 credit hours**

At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of the game development industry. The student will be able to:
01.01	Evaluate game concepts.
01.02	Compare different game concepts.
01.03	Compose a game concept document.
01.04	Present and justifying the game concept.
01.05	Identify and compare the different genres of games.
02.0	Identify the tools used in game development. The student will be able to:
02.01	Identify different computer programming languages used for game development.
02.02	Review different development environments for game development.
03.0	Describe the game development process. The student will be able to:
03.01	Distinguish the different stages of the game development process.
03.02	Create a generic plan for developing a game.
04.0	Create simple 3D game environments. The student will be able to:
04.01	Reproduce simple objects in different coordinate systems.
04.02	Manipulate screen coordinates to create new game levels.
04.03	Convert and export objects and levels between different 3D environments.
04.04	Create simple shapes and structures that can be exported to games or game editors.
04.05	Modify an existing level in a game using editing tools.
04.06	Create a level that can be ported to an existing game engine or editor.
04.07	Create conditional statements and loops for games.
04.08	Modify sprites to add simple motion to games.
04.09	Develop a simple 2D side scrolling game using a game development software kit.

05.0	Analyze the different uses of textures. The student will be able to:
05.01	Create texture maps for objects in games.
05.02	Modify existing texture maps to work with new designs.
05.03	Apply new textures for changing the look and feel of existing game levels.
05.04	Distinguish between the different types of texture mapping.
06.0	Design game levels using creation tools and editors. The student will be able to:
06.01	Distinguish the different level building tools.
06.02	Examine the game development process and application to help design new tools for building levels.
06.03	Distinguish the different types of levels in terms of fun factor.
06.04	Discuss how to decrease and increase the difficulty for players in each type of game level.
06.05	Create a new level for an existing game that is going to address all the issues of difficulty.
06.06	Create building blocks for game level editors and existing engines.
06.07	Create program that will be able to convert and export levels into game engines and level editors.
06.08	Modify existing items to make them exportable into game engines and level editors.
07.0	Code, compile, and execute programs. The student will be able to:
07.01	Write pseudocode and flow charts.
07.02	Apply the techniques of functional decomposition to break a programming design problem into smaller pieces.
07.03	Write code documentation.
07.04	Create programs that use all data types (float points, integers, long, double, Boolean, characters, and strings) and operators.
07.05	Create programs that use all existing operators.
07.06	Explain the properties of a variable, such as its name, value, scope, persistence, and size.
07.07	Create programs that use if, else if, and else statements to evaluate conditions.
07.08	Create programs that use logical operators (and, not, or), functions, conditional statements, structured and unstructured data types, and loops.
07.09	Write programs that use classes, data abstraction, encapsulation and polymorphism.
07.10	Test and design tests of software solutions.
07.11	Debug program code.
08.0	Demonstrate knowledge of object oriented programming and design concepts. The student will be able to:

	08.01 Apply principles of object-oriented programming (OOP).
09.0	Design and develop interfaces for games. The student will be able to:
	09.01 Analyze existing games and applications for interface usability and intuitiveness.
	09.02 Compare the requirements and limitations of games and application interfaces.
	09.03 Compare the requirements and limitations of PC games and console games interfaces.
	09.04 Use existing libraries to create new interfaces.
	09.05 Create reusable libraries for new interfaces.
	09.06 Create new interfaces for existing applications.
	09.07 Create new interfaces for PC and console games.
	09.08 Analyze existing input devices with respect to usability for different game genres.
	09.09 Analyze the restriction created by using different hardware for input such as, but not limited to: mice, trackballs, joysticks, and game pads.
	09.10 Write small games that use different input interfaces such as: mice, trackballs, joysticks, and game pads.
	09.11 Analyze existing output devices with respect to usability for different game genres.
	09.12 Analyze the restrictions created by using different hardware for output such as, but not limited to: touch screens, 3D glasses, sound, and motion simulation devices.
	09.13 Write small games that use different output interfaces such as: touch screens, 3D glasses, sound, and motion simulation devices.
	09.14 Analyze the programming and interface limitations of the console.
	09.15 Analyze different libraries and development tools for different game consoles.
	09.16 Write code that takes advantage of the console hardware for improving performance.
	09.17 Use existing programming libraries to communicate with hardware.
	09.18 Create new reusable programming libraries and classes for handling hardware input and output.
	09.19 Research past interface hardware.
	09.20 Analyze the failures of past computer input/output hardware.
	09.21 Research current developments in interface hardware.
	09.22 Research trends regarding the future of interfaces and game consoles.
10.0	Embed artificial intelligence (AI) methods and algorithms to create and modify games. The student will be able to:
	10.01 Examine the origins of artificial intelligence for games, and the first games to use artificial intelligence.
	10.02 Analyze how AI is used in games.

	10.03 Distinguish the different methods used to create AI for games.
	10.04 Modify existing AI methods for games.
	10.05 Create new AI methods games.
	10.06 Discuss at what level of programming AI starts.
11.0	Evaluate artificial intelligence (AI) Path Planning. The student will be able to:
	11.01 Research path planning.
	11.02 Discuss the advantages and disadvantages of path planning.
	11.03 Modify existing path planning code to change the behavior of the game's computer controlled characters.
	11.04 Enhance existing games by creating computer-controlled characters.
12.0	Apply principles of stimulus-response agents. The student will be able to:
	12.01 Modify code for different stimulus-response agent.
	12.02 Create computer-controlled characters using stimulus-response agents.
	12.03 Combine aspects of stimulus-response agents systems with other artificial intelligence methods to create new systems for computer controlled characters.
	12.04 Modify code for different stimulus-response agents.
	12.05 Create computer-controlled characters using stimulus-response agents.
	12.06 Combine aspects of stimulus-response agents systems with other artificial intelligence methods to create new systems for computer controlled characters.
13.0	Utilize agent architectures. The student will be able to:
	13.01 Modify code for different agent architectures.
	13.02 Create computer-controlled characters using agent architectures.
	13.03 Combine aspects of agent architectures systems with other AI methods to create new systems for computer controlled characters.
14.0	Create decision-making systems. The student will be able to:
	14.01 Modify code for different decision-making systems.
	14.02 Create computer-controlled characters using decision-making systems.
	14.03 Combine aspects of decision-making systems with other AI methods to create new systems for computer controlled characters.
15.0	Apply neural networks**.** The student will be able to:
	15.01 Modify code for artificial neural networks (ANNs).
	15.02 Create computer-controlled characters using ANNs.

	15.03 Combine aspects of neural networks systems with other AI methods to create new systems for computer controlled characters.
16.0	Utilize genetic algorithms**.** The student will be able to:
	16.01 Modify code for genetic algorithms systems.
	16.02 Create computer-controlled characters using genetic algorithms.
	16.03 Combine aspects of genetic algorithms systems with other AI methods to create new systems for computer controlled characters.
17.0	Create virtual reality environments. The student will be able to:
	17.01 Modify programs that use different graphics libraries.
	17.02 Use different graphics libraries in the final project and programming assignments.
	17.03 Develop libraries to use with 3D software development.
	17.04 Modify existing programs that use sound and music to add realism in game development.
	17.05 Modify sound systems to add direction and distance to sound effects.
	17.06 Use sound effects in programming assignments.
	17.07 Distinguish different sound file formats with respects to quality, and size.
	17.08 Use sound effects and music in the final project.
	17.09 Modify existing programs that use different types of input devices in game development.
	17.10 Use different input devices in the final project and programming assignments.
	17.11 Use forced feedback devices for input.
	17.12 Summarize papers on the future of input devices.
	17.13 Create 3D transparent objects.
	17.14 Summarize papers on alpha blending programming methods.
	17.15 Use transparency or fog in the final project.
	17.16 Distinguish partial systems in terms of their uses such as fire and explosions.
	17.17 Modify and write programs that use partial systems for special effects.
	17.18 Apply physics to particle systems for realism.
	17.19 Distinguish different methods for creating shadows.
	17.20 Experiment with different lighting effects.
	17.21 Modify 3D programs to include lighting and shadow effects in a 3D world.

17.22	Apply light and shadow effects in games to add realism.
17.23	Create light sources and shadows in the final project.
17.24	Modify existing programs that use reflection and refraction.
17.25	Develop programs that use light reflection and refraction.
17.26	Use light reflection and refraction in the final project.
17.27	Modify programs that use texture mapping.
17.28	Create 3D texture-mapped surfaces.
17.29	Use texture mapping in the final project.
17.30	Modify programs that use collision detection and reaction.
17.31	Compare different collision detection algorithms in terms of CPU usage and accuracy.
17.32	Use collision detection in the final project.
17.33	Discuss advantages of different collision methods.
17.34	Modify programs that use visible-surface determination.
17.35	Apply different algorithms for visible-surface determination to determine their effect on the performance of games and the game engines.
17.36	Modify programs that use hidden line removal.
17.37	Apply different algorithms for hidden line removal to determine their effects on the performance on games and the game engines.
17.38	Apply basic physics to a 3D game environment.
17.39	Create simplified calculations to mimic real life physics.
17.40	Manipulate physics functions to be applied to existing data structures that store the 3D world.
18.0	Create a complete working animated game or film. The student will be able to:
18.01	Distinguish game development projects.
18.02	Discuss case studies on game development projects.
18.03	Evaluate different types of projects in game development.
18.04	Create a game proposal document for a game development project.
18.05	Present and justifying the final completed project to the class.
18.06	Distinguish different team structures used in game development.
18.07	Work on a team project to experience a project management environment to develop a game from start to finish.

	18.08	Discuss case studies on team game development structures.
	18.09	Develop a game in teams from start to finish.
	18.10	Subdivide a game development project into parts.
	18.11	Research different game development processes.
	18.12	Apply one of the existing processes to develop a game from start to finish.
	18.13	Justify the game development process that was chosen for the project.
	18.14	Distinguish the stages of game development.
	18.15	Develop a game from start to end and working through all the stages of game development.
	18.16	Create a fully working game using all the skills gained in the game programming courses.
	18.17	Use all aspects of game programming development including graphics, sound, networking, software analysis, level building and design.
	18.18	Create a timeline, and meeting deadlines on their project.
	18.19	Use professional scheduling tools to communicate with the project team.
	18.20	Prepare progress reports.
	18.21	Use existing code from previous projects and publicly available code.
	18.22	Give credits or request permission to use codes.
19.0	Develop VR/AR Games. The student will be able to:	
	19.01	Examine the origins, history, and future of VR/AR applications for games.
	19.02	Recognize the key milestones in the evolution of Virtual Reality and Augmented Reality.
	19.03	Discuss the advantages and disadvantages of VR/AR applications.
	19.04	Recognize the hardware used to acquire and display VR/AR content
	19.05	Explain the protocols, principals, and techniques that are necessary to design VR/AR games to work on different platforms
	19.06	Evaluate a variety of VR/AR game development topics, including basic game design, layout, and controls.
	19.07	Identify the best-case and worst-case scenarios when producing VR/AR applications
	19.08	Examine the process of how VR/AR applications are designed for a specific end user.
	19.09	Conduct a project management process to complete the development of a VR/AR application
	19.10	Discuss issues of quality assurance, detect application errors, bug fixes, and overall application improvement.
	19.11	Use a game engine to create a cross-platform VR/AR application.

	19.12	Researching different VR/AR platforms.
	19.13	Develop the basics of 3D graphics, how to create objects, and how to lay them out to create a VR/AR environment.
	19.14	Identify devices that can be used to experience VR/AR
	19.15	Identify the key differences between VR/AR.
	19.16	Evaluate why VR is now more successful than it was during its initial conception.
20.0	Demonstrate an understanding of Game Systems. The student will be able to:	
	20.01	Explain the different types of game systems and their effect on gameplay.
	20.02	Explain the importance of balance in systems.
	20.03	Explain the importance of the metagame to elder players and how balance can be broken over the short term to create better metagaming experiences over the long term
	20.04	Identify the differences between game parameters, rules, and content.
	20.05	Identify the monetization strategies available for mobile games.
	20.06	Explain how to design for mobile resolutions, touch screen and mobile form factors
	20.07	Explain player progression and game state management in mobile games.
	20.08	Explain the different roles of probability within game systems and why it is in the best interest of the designer to be able to predict the outcomes of player actions.
	20.09	Explain common fallacies associated with probability in games, with a special emphasis on the fallacy of equipartition.
	20.10	Explain independent and related events in probability, and conditional probability.
	20.11	Explain the game core loops and how systems are related to the greater play experience.
	20.12	Identify different types of systems that exist in games and discussing how these systems affect each other.
	20.13	Identify data from systems and discuss how data can be used to inform balancing and future design.
	20.14	Explain contemporary techniques to use external game analytic APIs to measure pleasure progress and validate game design choices
	20.15	Explain the relationship between balancing parts and balanced game mechanics.
	20.16	Model a game system using probability and discussing the likelihood events will occur given certain conditions.
	20.17	Test systems with a significant sample and verifying that systems behaviors are predictable.
	20.18	Collect data and discussing the results.
	20.19	Create workbooks of spreadsheets that model systems.
	20.20	Develop spreadsheets with scripts that allow a user to predict the outcome of a system given certain player actions.

20.21	Test and balance their system models.
20.22	Explain how the creation of iterative prototypes aid in validating gameplay design choices.
20.23	Explain how mechanics can be used to tell a story in games and the “do, don’t show” principle of game storytelling.
20.24	Explain cussing an interest curve in games and how mechanics can be used to maintain interest over time as well as how these concepts fit in with different storytelling models.
20.25	Analyze an existing game and discussing how mechanics and systems could be used to tell the story more effectively through player action.
20.26	Discuss player progressions and immersion in games and how these concepts relate to mechanics and systems.
20.27	Modify an existing design document to incorporate balanced mechanics that add to gameplay.
20.28	Develop system documentation for a game design document.
20.29	Reference systems documentation effectively and using models to justify game design choices.
20.30	Create technical documentation that gives developer’s insight into their systems design (such as relevant equations and interrelationships) so that systems can be effectively developed.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Virtual and Augmented Reality Technologies (0550041118) -- 19 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Support Services**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	B078000	
CIP Number	0511090102	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in network support services positions in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	EEV0504	Computer Support Assistant	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	150 hours
C	CTS0022	Network Support Help Desk Assistant		150 hours
D	CTS0023	Network Support Administrator		150 hours
E	CTS0024	Senior Network Administrator		150 hours
F	CTS0029	Wireless Network Administrator		150 hours
G	EEV0317	Data Communications Analyst		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Incorporate appropriate leadership, customer-service strategies and professional ethics to enhance workplace performance.
17.0 Install, configure, and upgrade desktop and mobile computer systems following industry-standard procedures.
18.0 Diagnose and troubleshoot hardware, software, and connectivity problems.
19.0 Apply safety, maintenance, and environmental sustainability practices.
20.0 Demonstrate understanding of processors, memory and storage technologies.
21.0 Demonstrate knowledge of printing and imaging systems.
22.0 Demonstrate basic networking concepts and connectivity skills.
23.0 Provide effective end-user assistance.
24.0 Demonstrate proficiency using modern graphical user interfaces and productivity tools.
25.0 Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance.
26.0 Perform end-user support and assistance through troubleshooting and communication.
27.0 Understand and explain Internet connectivity and components.
28.0 Define networking terminology and models.
29.0 Connect copper, fiber-optic, and wireless media.
30.0 Perform cable testing and verification.

31.0 Identify network topologies, devices, and connections.
32.0 Explain Ethernet fundamentals and operations.
33.0 Explain the functions of bridges, switches, and VLANs.
34.0 Explain IP addressing and subnetting concepts.
35.0 Differentiate between routed and routing protocols.
36.0 Describe transport and application layer functions.
37.0 Explain WAN connectivity and router functions.
38.0 Perform basic router and switch configuration.
39.0 Troubleshoot network connectivity.
40.0 Describe network security concepts and access controls.
41.0 Use critical-thinking and research skills to solve IT problems.
42.0 Use information-technology productivity tools.
43.0 Demonstrate teamwork, professionalism, and ethics.
44.0 Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance.
45.0 Participate in simulated work-based learning experiences.
46.0 Provide network support and assistance by troubleshooting and diagnosing through direct contact or remote access.
47.0 Perform logical and physical network design activities.
48.0 Demonstrate proficiency in routing protocols and IP configuration for various network designs.
49.0 Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels or security.
50.0 Perform network management activities related to documentation, security, performance, administration, and troubleshooting.
51.0 Identify and describe wide-area network (WAN) functions, devices, and design processes.
52.0 Describe the operation and implantation of Virtual Private Networks (VPNs).
53.0 Demonstrate understanding of health, safety and environmental management systems.
54.0 Demonstrate leadership and teamwork skills to accomplish goals and objectives.
55.0 Explain employability and entrepreneurship skills.
56.0 Demonstrate personal money-management concepts and strategies.
57.0 Participate in simulated work-based learning experiences.
58.0 Compare and contrast hierarchical network design models and scalable internetworks.
59.0 Discuss advanced IP addressing management.
60.0 Demonstrate proficiency in router configuration and routing protocols.
61.0 Implement and verify OSPF (single and multi-area).
62.0 Demonstrate proficiency in route optimization and redistribution.
63.0 Demonstrate proficiency in the use of BGP and internet-scale routing.
64.0 Secure routing and infrastructure.
65.0 Configure and support WAN and VPN technologies.
66.0 Demonstrate proficiency in switching technologies and VLAN design.
67.0 Demonstrate multilayer switching and redundancy protocols.
68.0 Demonstrate proficiency with multicast and IGMP.
69.0 Demonstrate network access control and segmentation.
70.0 Use network management and troubleshooting tools.

71.0 Integrate cloud and virtual network technologies.
72.0 Participate in simulated work-based learning experiences.
73.0 Demonstrate proficiency in applying radio frequency (RF) technologies.
74.0 Develop an awareness of wireless LAN technologies.
75.0 Perform implementation and management activities.
76.0 Develop an awareness of wireless security systems.
77.0 Demonstrate knowledge of wireless industry standards.
78.0 Participate in simulated work-based learning experiences.
79.0 Demonstrate a knowledge of general security concepts.
80.0 Develop an awareness of communication security concepts.
81.0 Develop an awareness of network infrastructure security.
82.0 Develop an awareness of cryptography and its relation to security.
83.0 Incorporate organizational and operational security in an appropriate and effective manner.

Florida Department of Education
Student Performance Standards

Program Title: Network Support Services
Career Certificate Program Number: B078000

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**	
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)	
Course Number: EEV0504 **Occupational Completion Point: B** **Computer Support Assistant – 150 Hours**	
16.0	Incorporate appropriate leadership, customer-service strategies and professional ethics to enhance workplace performance. The student will be able to:
16.01	Develop courteous, solution-focused communication methods when assisting customers.
16.02	Demonstrate teamwork, adaptability, and positive attitude in classroom or help-desk simulations.
16.03	Apply ethical and confidentiality standards when handling user data or credentials.
16.04	Document service requests and resolutions accurately using digital ticketing or workflow systems.
17.0	Install, configure, and upgrade desktop and mobile computer systems following industry-standard procedures. The student will be able to:
17.01	Identify major hardware components (motherboard, CPU, memory, storage, power, I/O devices) and describe their functions.
17.02	Recognize modern interface standards (USB-C, HDMI, DisplayPort, Bluetooth, Wi-Fi, Ethernet).
17.03	Assemble, disassemble, and reassemble systems safely using antistatic and ESD precautions.
17.04	Install and configure operating systems (Windows 10/11, Linux, macOS) and required drivers.
17.05	Perform system updates, backups, and recovery procedures.
17.06	Install productivity, collaboration, and endpoint-management applications.
17.07	Configure basic virtualization software for testing or lab use.
17.08	Customize user settings, accessibility features, and regional preferences.
17.09	Explain the importance of firmware/BIOS updates and secure-boot settings.

18.0	Diagnose and troubleshoot hardware, software, and connectivity problems. The student will be able to:
	18.01 Apply structured troubleshooting methodologies to isolate faults.
	18.02 Use built-in diagnostics, system logs, and Task Manager to analyze performance issues.
	18.03 Troubleshoot startup failures, application crashes, and driver conflicts.
	18.04 Resolve common peripheral, display, and input/output problems.
	18.05 Identify symptoms of failing components and recommend replacement or repair.
	18.06 Diagnose basic network-connectivity issues using ping, ipconfig/ifconfig, and Wi-Fi utilities.
	18.07 Apply malware-removal and remediation techniques using approved tools.
	18.08 Document troubleshooting steps and verify operational success with the user.
19.0	Apply safety, maintenance, and environmental sustainability practices. The student will be able to:
	19.01 Follow safe tool usage, lifting, and electrical-safety guidelines.
	19.02 Perform routine cleaning, firmware updates, and hardware checks to maintain reliability.
	19.03 Dispose of electronic waste responsibly (batteries, toner, displays) per EPA and school-district standards.
	19.04 Apply ergonomic principles for workstation design and device placement.
	19.05 Secure devices and data using cable locks, privacy screens, and password protection.
20.0	Demonstrate understanding of processors, memory, and storage technologies. The student will be able to:
	20.01 Differentiate types and speeds of RAM, cache, and storage media (SSD, NVMe, cloud).
	20.02 Install and configure internal and external storage devices.
	20.03 Explain the relationship between CPU cores, threads, and virtualization features.
	20.04 Configure and verify disk partitions and file systems.
	20.05 Describe basic redundancy concepts such as RAID and cloud backup.
21.0	Demonstrate knowledge of printing and imaging systems. The student will be able to:
	21.01 Identify common printer types (laser, inkjet, thermal, multifunction) and their use cases.
	21.02 Install and configure printers locally and on a network.
	21.03 Troubleshoot print queues, driver mismatches, and connectivity issues.
	21.04 Implement environmentally responsible printing practices and consumable recycling.
22.0	Demonstrate basic networking concepts and connectivity skills. The student will be able to:

	22.01 Define networking and describe its purpose in a business environment.
	22.02 Identify the functions of key components (switches, routers, access points, cables).
	22.03 Explain network topologies, IP addressing, and common protocols (TCP/IP, DNS, DHCP).
	22.04 Connect and configure a workstation for wired and wireless access.
	22.05 Verify network connectivity and performance using diagnostic tools.
	22.06 Describe the importance of network security measures such as firewalls and encryption.
	22.07 Perform basic data-backup and restore operations using local or cloud storage.
	22.08 Explain the purpose of disaster-recovery planning and business-continuity concepts.
23.0	Provide effective end-user assistance. The student will be able to:
	23.01 Use professional communication and active-listening techniques when supporting users.
	23.02 Gather and record accurate problem details in a service ticket.
	23.03 Provide step-by-step guidance or remote assistance for basic issues.
	23.04 Escalate unresolved problems following established procedures.
24.0	Demonstrate proficiency using modern graphical user interfaces and productivity tools. The student will be able to:
	24.01 Navigate GUI environments and customize layouts for accessibility and efficiency.
	24.02 Use menus, ribbons, and keyboard shortcuts effectively.
	24.03 Organize and maintain file structures in local and cloud directories.
	24.04 Run multiple applications, manage windows, and multitask securely.
	24.05 Access help systems, documentation, and online knowledge bases for problem-solving.
Course Number: CTS0022 **Occupational Completion Point: C** **Network Support Help Desk Assistant – 150 Hours**	
25.0	Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance.The student will be able to:
	25.01 Communicate professionally and diplomatically with customers, demonstrating empathy and active listening.
	25.02 Document, escalate, and resolve technical incidents following service-desk protocols.
	25.03 Demonstrate professional ethics, integrity, and respect for confidentiality in IT environments.
26.0	Perform end-user support and assistance through troubleshooting and communication. The student will be able to:

	26.01 Apply first-response procedures for diagnosing hardware, OS, and network issues.
	26.02 Gather user information, reproduce problems, and document findings in a ticketing system.
	26.03 Use remote-assist tools (Quick Assist, RDP, SSH, or web-based support) to resolve user issues.
	26.04 Follow escalation paths and provide post-resolution feedback.
27.0	Understand and explain Internet connectivity and components. The student will be able to:
	27.01 Identify physical and logical components required for Internet access (ISP, modem, router, NIC).
	27.02 Differentiate between wired and wireless broadband technologies (fiber, cable, DSL, LTE, satellite).
	27.03 Configure and test basic network interface settings (IPv4/IPv6, DNS, gateway).
	27.04 Use browser settings and plug-ins to verify connectivity and performance.
28.0	Define networking terminology and models. The student will be able to:
	28.01 Explain bandwidth, throughput, latency, and jitter.
	28.02 Identify units of bandwidth (Kbps, Mbps, Gbps) and performance measurement tools.
	28.03 Describe the seven OSI layers and four TCP/IP layers.
	28.04 Compare OSI and TCP/IP models and explain their relationship.
	28.05 Define networking devices (hub, switch, router, WAP, firewall, access point).
	28.06 Differentiate LAN, WAN, MAN, PAN, and VPN networks.
	28.07 Explain intranets, extranets, and cloud-based networking.
	28.08 Describe the importance of standards bodies (IEEE, IETF, ISO).
29.0	Connect copper, fiber-optic, and wireless media. The student will be able to:
	29.01 Explain voltage, current, impedance, and signal loss as they relate to data transmission.
	29.02 Identify and terminate twisted-pair (Cat 5e, 6, 6A, 8) connectors using TIA/EIA-568-B standard.
	29.03 Describe coaxial and fiber-optic cable types, connectors, and use cases.
	29.04 Differentiate between single-mode and multimode fiber and demonstrate safe handling practices.
	29.05 Explain PoE, structured cabling, and patch-panel organization.
	29.06 Identify wireless standards (Wi-Fi 5/6/6E), frequencies, and channel planning basics.
30.0	Perform cable testing and verification. The student will be able to:
	30.01 Use continuity testers, cable certifiers, and TDR meters to verify connectivity.

	30.02 Recognize crosstalk, attenuation, and EMI issues.
	30.03 Interpret test results to determine pass/fail compliance with current cabling standards.
	30.04 Document cable runs, labeling, and test results.
31.0	Identify network topologies, devices, and connections. The student will be able to:
	31.01 Describe star, mesh, and hybrid topologies and their common uses.
	31.02 Differentiate between peer-to-peer and client-server models.
	31.03 Identify network hardware ports, cables, and connectors.
	31.04 Describe SOHO network architecture, router interfaces, and wireless access configuration.
32.0	Explain Ethernet fundamentals and operations. The student will be able to:
	32.01 Explain Ethernet frame structure and MAC addressing.
	32.02 Differentiate between half-duplex and full-duplex communication.
	32.03 Describe auto-negotiation, collision domains, and broadcast domains.
	32.04 Understand link aggregation (LACP) and VLAN tagging (802.1Q).
33.0	Explain the functions of bridges, switches, and VLANs. The student will be able to:
	33.01 Define switching, MAC address tables, and VLAN segmentation.
	33.02 Describe Spanning Tree Protocol (STP/RSTP) and its role in preventing loops.
	33.03 Differentiate between Layer 2 and Layer 3 switches.
	33.04 Troubleshoot common switching issues.
34.0	Explain IP addressing and subnetting concepts. The student will be able to:
	34.01 Describe IPv4 and IPv6 address structure, classes, and subnet masks.
	34.02 Explain public, private, and APIPA addresses.
	34.03 Perform basic subnetting calculations.
	34.04 Configure and test IP addressing on end-user devices.
	34.05 Explain DHCP and DNS roles in address assignment and resolution.
35.0	Differentiate between routed and routing protocols.The student will be able to:
	35.01 Explain the difference between static and dynamic routing.
	35.02 Identify common routing protocols (RIP, OSPF, EIGRP, BGP).

	35.03 Describe how routers forward packets and update routing tables.
	35.04 Verify routing configurations using show, ping, and traceroute commands.
36.0	Describe transport and application layer functions. The student will be able to:
	36.01 Explain TCP and UDP differences.
	36.02 Identify well-known ports and services (HTTP, HTTPS, DNS, RDP, SSH, SMTP).
	36.03 Explain session establishment, acknowledgments, and flow control.
	36.04 Describe encapsulation and decapsulation processes.
37.0	Explain WAN connectivity and router functions. The student will be able to:
	37.01 Describe WAN technologies such as leased lines, broadband, Metro Ethernet, and SD-WAN.
	37.02 Explain router roles, interfaces, and forwarding decisions.
	37.03 Identify common router components and IOS/firmware management.
	37.04 Describe VPN connections and tunneling basics.
38.0	Perform basic router and switch configuration. The student will be able to:
	38.01 Access devices via console, SSH, or web interface.
	38.02 Configure hostnames, passwords, and interface IP addresses.
	38.03 Save, back up, and restore configurations.
	38.04 Upgrade firmware and verify version control.
39.0	Troubleshoot network connectivity. The student will be able to:
	39.01 Use ICMP tools (ping, tracert, pathping) to verify connectivity.
	39.02 Interpret ARP tables and MAC address mappings.
	39.03 Diagnose DNS, DHCP, and default-gateway issues.
	39.04 Resolve common Wi-Fi connectivity and authentication problems.
40.0	Describe network security concepts and access controls. The student will be able to:
	40.01 Explain firewalls, ACLs, and port filtering.
	40.02 Recognize authentication methods (password, MFA, certificate).
	40.03 Describe VPN encryption and secure tunneling.
	40.04 Explain endpoint security best practices (antivirus, patching, updates).

41.0	Use critical-thinking and research skills to solve IT problems. The student will be able to:
	41.01 Apply logical troubleshooting methodologies (CompTIA 6-step model).
	41.02 Perform technical research using documentation and vendor resources.
	41.03 Document problems, solutions, and knowledge-base entries.
42.0	Use information-technology productivity tools. The student will be able to:
	42.01 Employ collaborative tools (Google Workspace, Microsoft 365) for communication and documentation.
	42.02 Use spreadsheets, databases, and reporting tools to track assets and incidents.
	42.03 Utilize ticketing or ITSM software to manage service requests.
43.0	Demonstrate teamwork, professionalism, and ethics. The student will be able to:
	43.01 Collaborate within a help-desk team to meet service-level agreements.
	43.02 Demonstrate ethical handling of user data and credentials.
	43.03 Apply cultural awareness and accessibility principles when supporting diverse users.
Course Number: CTS0023 Occupational Completion Point: D Network Support Administrator – 150 Hours	
44.0	Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance.The student will be able to:
	44.01 Apply professional communication skills when interacting with users and team members.
	44.02 Demonstrate customer-service excellence, conflict resolution, and diplomacy in technical support situations.
	44.03 Model ethical behavior, confidentiality, and integrity in network operations.
45.0	Participate in simulated work-based learning experiences. The student will be able to:
	45.01 Perform simulated help-desk and network-support tasks using professional ticketing systems.
	45.02 Document incidents, configurations, and resolutions following ITIL/industry-standard practices.
	45.03 Demonstrate collaboration, accountability, and continuous improvement within a technical team.
46.0	Provide network support and assistance by troubleshooting and diagnosing through direct contact or remote access. The student will be able to:
	46.01 Apply structured troubleshooting methodologies to identify and resolve network connectivity issues.
	46.02 Perform local and remote network diagnostics using tools such as ping, traceroute, ipconfig, netstat, and Wireshark.

	46.03 Utilize remote-access platforms (SSH, RDP, VPN) to support distributed users securely.
	46.04 Escalate and document unresolved issues in accordance with service-level agreements.
47.0	Perform logical and physical network design activities. The student will be able to:
	47.01 Identify and resolve common LAN communication and topology problems.
	47.02 Describe the effects and advantages of network segmentation using VLANs and Layer-3 routing.
	47.03 Explain LAN design principles including redundancy, scalability, and fault tolerance.
	47.04 Create and interpret physical and logical network diagrams using industry notation.
	47.05 Select appropriate devices, cabling, and media for new installations or upgrades.
	47.06 Document configurations, IP addressing schemes, and rack/equipment layouts.
48.0	Demonstrate proficiency in routing protocols and IP configuration for various network designs. The student will be able to:
	48.01 Explain IPv4 and IPv6 addressing, subnetting, and Variable Length Subnet Masking (VLSM).
	48.02 Configure and verify static, default, and dynamic routes using protocols such as OSPF and EIGRP.
	48.03 Describe the role of ICMP and routing metrics in path selection.
	48.04 Explain how link-state and distance-vector protocols update routing tables.
	48.05 Implement addressing plans that support scalability and efficient subnet allocation.
49.0	Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security. The student will be able to:
	49.01 Describe the purpose and operation of ACLs and traffic filters.
	49.02 Configure standard and extended access control lists to permit or deny network traffic.
	49.03 Monitor filtered traffic and verify ACL operation using show/debug commands.
	49.04 Differentiate between stateless and stateful packet inspection methods.
50.0	Perform network management activities related to documentation, security, performance, administration, and troubleshooting. The student will be able to:
	50.01 Maintain network documentation including topology diagrams, device inventory, and configuration backups.
	50.02 Implement security controls such as password policies, multifactor authentication, and least-privilege access.
	50.03 Use monitoring tools (SNMP, Syslog, NetFlow, Zabbix, or PRTG) to analyze performance metrics.
	50.04 Establish performance baselines and plan for capacity or throughput improvements.
	50.05 Apply administrative practices including asset tracking, budgeting, and change-management processes.
	50.06 Identify environmental factors (temperature, humidity, cable management) that affect network reliability.

51.0	Identify and describe wide-area network (WAN) functions, devices, and design processes. The student will be able to:
	51.01 Explain modern WAN technologies including MPLS, Metro Ethernet, broadband, and SD-WAN.
	51.02 Differentiate between private and public WAN connections and their security implications.
	51.03 Design redundant WAN links using VPN tunnels, dual ISPs, or cellular failover.
	51.04 Verify WAN connectivity and troubleshoot routing or encapsulation issues.
52.0	Describe the operation and implementation of Virtual Private Networks (VPNs). The student will be able to:
	52.01 Explain VPN principles including encryption, tunneling, and encapsulation.
	52.02 Differentiate between site-to-site, remote-access, and clientless VPNs.
	52.03 Configure and verify basic IPsec or SSL VPN connections.
	52.04 Describe VPN authentication using RADIUS, LDAP, or certificate services.
53.0	Demonstrate understanding of health, safety, and environmental management systems. The student will be able to:
	53.01 Follow personal and lab safety procedures when working with network hardware and cabling.
	53.02 Explain emergency procedures for electrical, fire, or environmental hazards.
	53.03 Develop a disaster-response and data-backup plan that supports business continuity.
54.0	Demonstrate leadership and teamwork skills to accomplish goals and objectives. The student will be able to:
	54.01 Apply leadership principles to coordinate technical projects and mentor peers.
	54.02 Collaborate effectively within cross-functional teams to resolve network issues.
	54.03 Conduct and document technical meetings and briefings.
	54.04 Promote diversity, inclusion, and respectful communication in the workplace.
55.0	Explain employability and entrepreneurship skills. The student will be able to:
	55.01 Demonstrate positive work habits, adaptability, and professionalism.
	55.02 Develop a personal career and certification plan aligned with IT industry pathways.
	55.03 Research licensing, certification, and continuing-education requirements.
	55.04 Maintain a digital career portfolio of skills, credentials, and achievements.
	55.05 Evaluate employment and entrepreneurship opportunities in networking fields.
56.0	Demonstrate personal money-management concepts and strategies. The student will be able to:
	56.01 Identify and describe the services and legal responsibilities of financial institutions.

	56.02 Describe the effect of money management on personal and career goals.
	56.03 Develop a personal budget and financial goals.
	56.04 Complete financial instruments for making deposits and withdrawals.
	56.05 Maintain financial records.
Course Number: CTS0024 Occupational Completion Point: E Senior Network Administrator – 150 Hours	
57.0	Participate in simulated work-based learning experiences. The student will be able to:
	57.01 Participate in simulated network engineering tasks using enterprise tools (tickets, monitoring, automation).
	57.02 Collaborate with team members to plan, implement, and document advanced network projects.
58.0	Compare and contrast hierarchical network design models and scalable internetworks. The student will be able to:
	58.01 Demonstrate the use of the three-tier and collapsed-core design models.
	58.02 Describe router and switch functions within the core, distribution, and access layers.
	58.03 Explain principles of resiliency, availability, efficiency, adaptability, and security in modern network design.
59.0	Discuss advanced IP addressing management. The student will be able to:
	59.01 Plan and implement IPv4 and IPv6 addressing schemes using VLSM and CIDR.
	59.02 Explain supernetting, route summarization, and address aggregation.
	59.03 Configure NAT and PAT for IPv4 and describe IPv6 address translation mechanisms.
	59.04 Deploy and manage DHCP services and relay agents (IP helper addresses).
	59.05 Discuss the global IPv6 transition and dual-stack deployment strategies.
60.0	Demonstrate proficiency in router configuration and routing protocols. The student will be able to:
	60.01 Configure static and default routes and implement dynamic routing (OSPFv3, EIGRP).
	60.02 Explain routing convergence, metrics, and path selection.
	60.03 Use show and debug commands to verify routing operation and troubleshoot failures.
	60.04 Document router configuration and change-control procedures.
61.0	Implement and verify OSPF (single and multi-area). The student will be able to:
	61.01 Configure OSPFv3 interfaces and establish adjacencies.

	61.02 Elect Designated and Backup Routers and verify link-state database synchronization.
	61.03 Implement multi-area OSPF and summarize routes for scalability.
	61.04 Use verification commands to monitor neighbors, LSAs, and area connectivity.
62.0	Demonstrate proficiency in route optimization and redistribution. The student will be able to:
	62.01 Control routing updates using filters, prefix lists, and policy routing.
	62.02 Redistribute routes between multiple protocols while preventing loops.
	62.03 Optimize routing performance and stability with timers and administrative distance.
63.0	Demonstrate proficiency in the use of BGP and internet-scale routing. The student will be able to:
	63.01 Explain Autonomous Systems and BGP path-selection processes.
	63.02 Configure eBGP and iBGP sessions, route filters, and communities.
	63.03 Implement redundancy and load-balancing in multi-homed environments.
	63.04 Verify and troubleshoot BGP operations using monitoring commands and logs.
64.0	Secure routing and infrastructure. The student will be able to:
	64.01 Implement router access control lists (ACLs) and control-plane policing.
	64.02 Configure secure management access (SSH, HTTPS, SNMPv3).
	64.03 Harden device configurations and limit unnecessary services.
	64.04 Implement AAA for administrative access using RADIUS or TACACS+.
65.0	Configure and support WAN and VPN technologies. The student will be able to:
	65.01 Explain modern WAN options (MPLS, Metro Ethernet, SD-WAN, VPN).
	65.02 Configure site-to-site and remote-access VPNs using IPsec or SSL.
	65.03 Monitor and troubleshoot WAN connectivity and tunnels.
66.0	Demonstrate proficiency in switching technologies and VLAN design. The student will be able to:
	66.01 Explain switching concepts and the hierarchical model.
	66.02 Configure VLANs, trunks, and VTP (or modern VLAN management techniques).
	66.03 Implement redundancy protocols (STP, RSTP, MSTP).
	66.04 Verify and troubleshoot VLAN and trunk operations.
67.0	Demonstrate multilayer switching and redundancy protocols. The student will be able to:

	67.01 Configure Layer 3 switching with SVIs and inter-VLAN routing.
	67.02 Implement HSRP or VRRP for gateway redundancy.
	67.03 Verify redundant path operations and failover behavior.
68.0	Demonstrate proficiency with multicast and IGMP. The student will be able to:
	68.01 Explain multicast operation and IGMP versions.
	68.02 Configure PIM sparse and dense modes in a lab environment.
	68.03 Verify and troubleshoot multicast group membership and routing.
69.0	Demonstrate network access control and segmentation. The student will be able to:
	69.01 Create and apply network security policies and ACLs.
	69.02 Segment networks using VLANs, ACLs, and private VLANs for security and performance.
	69.03 Integrate switch security features (port security, DHCP snooping, ARP inspection).
70.0	Use network management and troubleshooting tools. The student will be able to:
	70.01 Explain structured troubleshooting methodologies and ITIL incident flows.
	70.02 Utilize SNMP, NetFlow, and Syslog for network monitoring.
	70.03 Use CLI and GUI tools (ping, traceroute, Wireshark, Nmap) for diagnostics.
	70.04 Document and report findings using network diagrams and change records.
71.0	Integrate cloud and virtual network technologies. The student will be able to:
	71.01 Explain virtual network components (VLANs, vSwitches, VXLAN).
	71.02 Configure and manage network interfaces in virtualization platforms.
	71.03 Explain hybrid connectivity between on-premises and cloud networks.
Course Number: CTS0029 Occupational Completion Point: F Wireless Network Administrator – 150 Hours	
72.0	Participate in simulated work-based learning experiences. The student will be able to:
	72.01 Participate in simulated wireless network support tasks including installation, configuration, and troubleshooting of WLAN components.
	72.02 Use network monitoring and documentation tools to log maintenance activities and technical findings.
	72.03 Demonstrate effective communication, teamwork, and customer service within a wireless support environment.

73.0	Demonstrate proficiency in applying radio frequency (RF) technologies. The student will be able to:
	73.01 Define and apply basic RF behavior concepts including frequency, amplitude, wavelength, and signal attenuation.
	73.02 Explain antenna types (omnidirectional, directional, sector, patch) and their uses in various wireless environments.
	73.03 Identify components affecting RF transmission such as gain, reflection, absorption, and interference.
	73.04 Describe spread-spectrum techniques including DSSS, OFDM, and MIMO as used in modern Wi-Fi standards.
	73.05 Explain channel bonding, bandwidth allocation, and modulation schemes (QAM, OFDMA).
	73.06 Identify FCC regulations governing wireless transmissions including frequency bands, channel spacing, and power limits.
	73.07 Recognize common interference sources (Bluetooth, microwave, IoT) and recommend mitigation strategies.
74.0	Develop an awareness of wireless LAN technologies. The student will be able to:
	74.01 Explain IEEE 802.11 a/b/g/n/ac/ax/be standards and their relative speeds, frequencies, and capabilities.
	74.02 Describe authentication and association processes between clients and access points.
	74.03 Define SSID, BSSID, ESS, and describe client roaming between access points.
	74.04 Explain power management features and their impact on battery life and performance.
	74.05 Differentiate between infrastructure, ad hoc, mesh, and cloud-managed WLAN architectures.
75.0	Perform implementation and management activities. The student will be able to:
	75.01 Determine where wireless LAN technology is suitable based on coverage and performance requirements.
	75.02 Install, configure, and manage wireless access points, controllers, and cloud-based WLAN systems.
	75.03 Configure and manage wireless LAN client devices and adapters.
	75.04 Install and secure wireless LAN gateways and bridges for inter-network connectivity.
	75.05 Identify antenna attributes such as gain, beamwidth, and polarization for proper deployment.
	75.06 Plan antenna placement and alignment for optimal coverage and minimal interference.
	75.07 Calculate free-space path loss and apply basic link-budget concepts.
	75.08 Identify and manage WLAN accessories (PoE injectors, cabling, mounting hardware).
	75.09 Diagnose and correct common WLAN challenges such as multipath, reflection, and absorption.
	75.10 Explain how antenna diversity and MIMO technologies improve reliability and throughput.
	75.11 Conduct a wireless site survey to assess coverage, capacity, and interference.
	75.12 Identify required tools and equipment for predictive and active RF site surveys.

	75.13 Perform site surveys and document findings with signal maps and heatmaps.
	75.14 Analyze results and provide site-survey reports with recommendations.
76.0	Develop an awareness of wireless security systems. The student will be able to:
	76.01 Compare wireless security protocols (WEP, WPA2, WPA3) and their relative strengths and weaknesses.
	76.02 Identify common WLAN security threats including rogue APs, Evil Twin, deauthentication, and packet sniffing attacks.
	76.03 Implement security features such as 802.1X authentication, RADIUS integration, and encryption.
	76.04 Apply corporate wireless security policies including password, encryption, and network segmentation standards.
	76.05 Use wireless analyzers to detect unauthorized devices and validate network compliance.
77.0	Demonstrate knowledge of wireless industry standards. The student will be able to:
	77.01 Differentiate between 2.4 GHz, 5 GHz, and 6 GHz frequency bands, including channel widths and limitations.
	77.02 Identify key industry organizations including IEEE, Wi-Fi Alliance, FCC, and IETF, and their roles in WLAN standardization.
	77.03 Explain the differences between ISM and UNII bands and their permitted applications.
	77.04 Describe power-output regulations and antenna-alignment requirements for point-to-point and point-to-multipoint links.
	77.05 Recognize current and emerging wireless technologies such as Wi-Fi 6E/7, IoT, and private 5G.
Course Number: EEV0317 **Occupational Completion Point: G** **Data Communications Analyst – 150 Hours**	
78.0	Participate in simulated work-based learning experiences. The student will be able to:
	78.01 Participate in simulated network support activities using help-desk or ticketing systems.
	78.02 Use collaboration and documentation platforms to record network incidents and service tasks.
	78.03 Demonstrate professional and supervisory skills appropriate for a network support environment.
79.0	Demonstrate a knowledge of general security concepts. The student will be able to:
	79.01 Describe access-control models (MAC, DAC, RBAC, Zero Trust).
	79.02 Explain authentication and authorization processes (MFA, SSO, identity providers).
	79.03 Identify common cyberattacks (phishing, DDoS, spoofing, social engineering, insider threats).
	79.04 Harden endpoints by disabling unused services and enforcing secure configuration baselines.
	79.05 Recognize and mitigate malware types (viruses, worms, Trojans, ransomware).

	79.06 Configure system auditing, logging, and vulnerability scanning to support incident response.
80.0	Develop an awareness of communication security concepts. The student will be able to:
	80.01 Configure secure remote-access solutions (VPN, RADIUS, L2TP, SAML, ZTNA).
	80.02 Identify email-security risks (spam, spoofing, malicious attachments) and apply mitigation techniques.
	80.03 Explain web and application-security concepts (HTTPS, TLS certificates, content filtering).
	80.04 Demonstrate secure file-transfer methods (SFTP, FTPS, encrypted cloud storage).
	80.05 Describe wireless-security protocols (WPA3, 802.1X) and common vulnerabilities.
81.0	Develop an awareness of network infrastructure security. The student will be able to:
	81.01 Install and configure firewalls and access-control lists to protect network segments.
	81.02 Identify physical and signal security considerations for copper and fiber media.
	81.03 Secure removable media and external devices through encryption and policy controls.
	81.04 Describe secure network topologies (DMZ, security zones, NAT, micro-segmentation).
	81.05 Deploy and monitor intrusion-detection and prevention systems (IDS/IPS).
	81.06 Maintain security baselines through updates, patch management, and configuration control.
	81.07 Configure Virtual Private Networks (VPNs) for secure remote connectivity.
	81.08 Explain the role of NAT, firewall rules, and routing policies in network security.
82.0	Develop an awareness of cryptography and its relation to security. The student will be able to:
	82.01 Explain modern encryption algorithms (AES, RSA, ECC) and hash functions (SHA-3).
	82.02 Use digital certificates and PKI to authenticate users and devices.
	82.03 Describe cryptographic standards and protocols used in secure commerce (SSL/TLS, tokenization, digital signatures).
83.0	Incorporate organizational and operational security in an appropriate and effective manner. The student will be able to:
	83.01 Develop and apply a network-security policy and incident-response procedures.
	83.02 Implement physical security controls (badges, locks, cameras, secure racks).
	83.03 Establish and test backup and disaster-recovery plans.
	83.04 Explain business-continuity principles and their relationship to network resilience.
	83.05 Describe acceptable-use, password, and remote-access policies within an organization.
	83.06 Apply privilege management and role-based access to systems and data.

83.07	Describe digital-forensics concepts related to incident response and evidence handling.
83.08	Promote security-awareness training for employees and supervisors.
83.09	Document security standards, procedures, and change-management records.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Network Systems Administration**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	B079300	
CIP Number	0511090105	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Computer Support Assistant, Network Support Technician, Systems Administrator, Systems Engineer, Wireless Network Administrator, and Data Communications Analyst in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	EEV0504	Computer Support Assistant	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	150 hours
C	CTS0026	Network Support Technician		150 hours
D	CTS0027	Systems Administrator		150 hours
E	CTS0028	Systems Engineer		150 hours
F	CTS0029	Wireless Network Administrator		150 hours
G	EEV0317	Data Communications Analyst		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, Internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Incorporate appropriate leadership, customer-service strategies and professional ethics to enhance workplace performance.
17.0 Install, configure, and upgrade desktop and mobile computer systems following industry-standard procedures.
18.0 Diagnose and troubleshoot hardware, software, and connectivity problems.
19.0 Apply safety, maintenance, and environmental sustainability practices.
20.0 Demonstrate understanding of processors, memory and storage technologies.
21.0 Demonstrate knowledge of printing and imaging systems.
22.0 Demonstrate basic networking concepts and connectivity skills.
23.0 Provide effective end-user assistance.
24.0 Demonstrate proficiency using modern graphical user interfaces and productivity tools.
25.0 Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance.
26.0 Participate in work-based learning experiences.
27.0 Perform end-user support through multiple communication channels.
28.0 Install and configure operating systems and network services.
29.0 Demonstrate proficiency using network standards and protocols.
30.0 Configure and troubleshoot hardware devices and drivers.

31.0 Monitor and optimize system performance and reliability.
32.0 Manage and troubleshoot storage and user data.
33.0 Configure and troubleshoot network connections.
34.0 Implement and troubleshoot system and network security.
35.0 Demonstrate effective communication in technical environments.
36.0 Apply critical thinking and problem-solving skills.
37.0 Use information technology tools to enhance productivity and collaboration.
38.0 Describe organizational roles and team dynamics in IT environments.
39.0 Demonstrate professional ethics and legal responsibilities in IT support.
40.0 Incorporate leadership, customer-service strategies, and ethical standards to enhance workplace performance.
41.0 Participate in work-based learning experiences.
42.0 Administer accounts and resources on computers running server operating systems.
43.0 Modify and manage directory objects.
44.0 Perform administrative functions using groups.
45.0 Manage access to resources and permissions.
46.0 Implement printing and device management in a network environment.
47.0 Delegate administrative control and manage organizational units.
48.0 Implement Group Policy and centralized configuration management.
49.0 Manage computer and server security.
50.0 Administer servers remotely.
51.0 Monitor and analyze server performance.
52.0 Collect performance data and identify system bottlenecks.
53.0 Maintain device drivers and hardware compatibility.
54.0 Configure and manage disks and volumes.
55.0 Secure data through encryption and quotas.
56.0 Plan for and perform disaster recovery and business continuity.
57.0 Manage software updates and patch management.
58.0 Configure IP addressing and troubleshoot address issues.
59.0 Configure an Internet protocol (IP) address for client computers.
60.0 Implement name resolution and DNS services.
61.0 Configure routing, remote access, and VPN connectivity.
62.0 Install and configure client operating systems.
63.0 Configure and support remote and mobile users.
64.0 Monitor resources and system performance.
65.0 Demonstrate the importance of health, safety, and environmental management systems.
66.0 Demonstrate leadership and teamwork skills.
67.0 Explain employability and entrepreneurship skills.
68.0 Apply communication skills (reading, writing, speaking, listening, viewing) in a courteous, concise, and correct manner on personal and professional levels.
69.0 Participate in work-based learning experiences.

70.0 Plan a network infrastructure.
71.0 Plan and optimize a TCP/IP physical and logical network.
72.0 Plan and troubleshoot routing.
73.0 Plan a DHCP strategy.
74.0 Plan a DNS strategy.
75.0 Optimize and troubleshoot DNS.
76.0 Plan and troubleshoot IPsec and network security.
77.0 Plan network access.
78.0 Troubleshoot network access.
79.0 Analyze global director infrastructure.
80.0 Implement directory and domain structure.
81.0 Implement organizational unit (O.U.) structures.
82.0 Implement user, group, and computer accounts.
83.0 Implement Group Policy and access management.
84.0 Deploy and manage software and updates through policy.
85.0 Implement sites and replication strategies.
86.0 Implement domain-controller placement and resilience.
87.0 Design and apply a security framework.
88.0 Recognize and predict common threats by using a threat model.
89.0 Apply risk management principles.
90.0 Design security for physical resources.
91.0 Design security for computers and endpoints.
92.0 Design security for accounts and identities.
93.0 Design security for authentication and access control.
94.0 Design security for data and storage.
95.0 Design security for data transmission.
96.0 Design security for network perimeters and edge devices.
97.0 Design an audit policy and an incident response procedure.
98.0 Linux Foundation.
99.0 Linux Fundamentals.
100.0 Linux installation and configuration.
101.0 Linux Systems Operation.
102.0 Linux users, groups, and permissions.
103.0 Linux Basic Security and System Monitoring.
104.0 Participate in simulated work-based learning experiences.
105.0 Demonstrate proficiency in applying radio frequency (RF) technologies.
106.0 Develop an awareness of wireless LAN technologies.
107.0 Perform implementation and management activities.
108.0 Develop an awareness of wireless security systems.
109.0 Demonstrate knowledge of wireless industry standards.

110.0 Participate in simulated work-based learning experiences.
111.0 Demonstrate knowledge of general security concepts.
112.0 Develop an awareness of communication security concepts.
113.0 Develop an awareness of network infrastructure security.
114.0 Develop an awareness of cryptography and its relation to security.
115.0 Incorporate organizational and operational security in an appropriate and effective manner.

Florida Department of Education
Student Performance Standards

Program Title: Network Systems Administration
Career Certificate Program Number: B079300

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**	
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)	
Course Number: EEV0504 **Occupational Completion Point: B** **Computer Support Assistant – 150 Hours**	
16.0	Incorporate appropriate leadership, customer-service strategies and professional ethics to enhance workplace performance. The student will be able to:
16.01	Develop courteous, solution-focused communication methods when assisting customers.
16.02	Demonstrate teamwork, adaptability, and positive attitude in classroom or help-desk simulations.
16.03	Apply ethical and confidentiality standards when handling user data or credentials.
16.04	Document service requests and resolutions accurately using digital ticketing or workflow systems.
17.0	Install, configure, and upgrade desktop and mobile computer systems following industry-standard procedures. The student will be able to:
17.01	Identify major hardware components (motherboard, CPU, memory, storage, power, I/O devices) and describe their functions.
17.02	Recognize modern interface standards (USB-C, HDMI, DisplayPort, Bluetooth, Wi-Fi, Ethernet).
17.03	Assemble, disassemble, and reassemble systems safely using antistatic and ESD precautions.
17.04	Install and configure operating systems (Windows 10/11, Linux, macOS) and required drivers.
17.05	Perform system updates, backups, and recovery procedures.
17.06	Install productivity, collaboration, and endpoint-management applications.
17.07	Configure basic virtualization software for testing or lab use.
17.08	Customize user settings, accessibility features, and regional preferences.
17.09	Explain the importance of firmware/BIOS updates and secure-boot settings.

18.0	Diagnose and troubleshoot hardware, software, and connectivity problems. The student will be able to:
	18.01 Apply structured troubleshooting methodologies to isolate faults.
	18.02 Use built-in diagnostics, system logs, and Task Manager to analyze performance issues.
	18.03 Troubleshoot startup failures, application crashes, and driver conflicts.
	18.04 Resolve common peripheral, display, and input/output problems.
	18.05 Identify symptoms of failing components and recommend replacement or repair.
	18.06 Diagnose basic network-connectivity issues using ping, ipconfig/ifconfig, and Wi-Fi utilities.
	18.07 Apply malware-removal and remediation techniques using approved tools.
	18.08 Document troubleshooting steps and verify operational success with the user.
19.0	Apply safety, maintenance, and environmental sustainability practices.
	19.01 Follow safe tool usage, lifting, and electrical-safety guidelines.
	19.02 Perform routine cleaning, firmware updates, and hardware checks to maintain reliability.
	19.03 Dispose of electronic waste responsibly (batteries, toner, displays) per EPA and school-district standards.
	19.04 Apply ergonomic principles for workstation design and device placement.
	19.05 Secure devices and data using cable locks, privacy screens, and password protection.
20.0	Demonstrate understanding of processors, memory, and storage technologies. The student will be able to:
	20.01 Differentiate types and speeds of RAM, cache, and storage media (SSD, NVMe, cloud).
	20.02 Install and configure internal and external storage devices.
	20.03 Explain the relationship between CPU cores, threads, and virtualization features.
	20.04 Configure and verify disk partitions and file systems.
	20.05 Describe basic redundancy concepts such as RAID and cloud backup.
21.0	Demonstrate knowledge of printing and imaging systems. The student will be able to:
	21.01 Identify common printer types (laser, inkjet, thermal, multifunction) and their use cases.
	21.02 Install and configure printers locally and on a network.
	21.03 Troubleshoot print queues, driver mismatches, and connectivity issues.
	21.04 Implement environmentally responsible printing practices and consumable recycling.
22.0	Demonstrate basic networking concepts and connectivity skills.

	22.01 Define networking and describe its purpose in a business environment.
	22.02 Identify the functions of key components (switches, routers, access points, cables).
	22.03 Explain network topologies, IP addressing, and common protocols (TCP/IP, DNS, DHCP).
	22.04 Connect and configure a workstation for wired and wireless access.
	22.05 Verify network connectivity and performance using diagnostic tools.
	22.06 Describe the importance of network security measures such as firewalls and encryption.
	22.07 Perform basic data-backup and restore operations using local or cloud storage.
	22.08 Explain the purpose of disaster-recovery planning and business-continuity concepts.
23.0	Provide effective end-user assistance. The student will be able to:
	23.01 Use professional communication and active-listening techniques when supporting users.
	23.02 Gather and record accurate problem details in a service ticket.
	23.03 Provide step-by-step guidance or remote assistance for basic issues.
	23.04 Escalate unresolved problems following established procedures.
24.0	Demonstrate proficiency using modern graphical user interfaces and productivity tools. The student will be able to:
	24.01 Navigate GUI environments and customize layouts for accessibility and efficiency.
	24.02 Use menus, ribbons, and keyboard shortcuts effectively.
	24.03 Organize and maintain file structures in local and cloud directories.
	24.04 Run multiple applications, manage windows, and multitask securely.
	24.05 Access help systems, documentation, and online knowledge bases for problem-solving.
Course Number: CTS0026 **Occupational Completion Point: C** **Network Support Technician – 150 Hours**	
25.0	Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance. The student will be able to:
	25.01 Communicate professionally and diplomatically with customers and peers to resolve technical issues.
	25.02 Demonstrate integrity, confidentiality, and professional ethics when handling client information.
26.0	Participate in work-based learning experiences. The student will be able to:
	26.01 Participate in simulated or real network support projects using trouble-ticket systems and change-management workflows.

	26.02 Demonstrate the use of technology tools to support end-users, including remote-support and collaboration platforms.
27.0	Provide end-user support through multiple communication channels. The student will be able to:
	27.01 Perform first-response troubleshooting for hardware, software, and network issues via phone, email, chat, or remote desktop.
	27.02 Document incidents accurately and follow escalation procedures.
	27.03 Demonstrate effective listening and customer-service skills when assisting users.
28.0	Install and configure operating systems and network services. The student will be able to:
	28.01 Install, configure, and update client operating systems (Windows 10/11, Linux Mint/Ubuntu).
	28.02 Join workstations to a domain or directory service (Active Directory, Azure AD, or LDAP).
	28.03 Configure Internet connectivity and basic LAN parameters (IP, DNS, gateway).
	28.04 Deploy operating-system images using WDS, MDT, or cloning software.
	28.05 Install and configure network applications such as file sharing, printers, and web services.
	28.06 Monitor and troubleshoot shared resources and permissions.
	28.07 Implement remote-management tools and assist with updates and patches.
29.0	Demonstrate proficiency using network standards and protocols. The student will be able to:
	29.01 Describe the purpose of network standards (IEEE, IETF) and protocols (TCP/IP, DNS, DHCP, HTTP, FTP, SSH).
	29.02 Explain the OSI and TCP/IP models and map common protocols to each layer.
	29.03 Use network utilities (ping, tracert, ipconfig, nslookup, netstat) to verify connectivity.
30.0	Configure and troubleshoot hardware devices and drivers. The student will be able to:
	30.01 Install and configure hardware components (NICs, storage, peripherals).
	30.02 Update, roll back, or uninstall device drivers.
	30.03 Troubleshoot hardware resource conflicts and compatibility issues.
	30.04 Use diagnostic utilities to verify device functionality and firmware versions.
31.0	Monitor and optimize system performance and reliability. The student will be able to:
	31.01 Monitor CPU, memory, disk, and network usage using built-in tools (Task Manager, Resource Monitor, Performance Monitor).
	31.02 Manage startup processes and optimize system resources.
	31.03 Implement scheduled maintenance tasks (cleanups, updates, defragmentation).
	31.04 Perform system and user data backups and restores.

32.0	Manage and troubleshoot storage and user data. The student will be able to:
	32.01 Configure user profiles and local folder redirection.
	32.02 Partition and format drives; monitor and repair volumes using disk utilities.
	32.03 Configure disk quotas and data compression.
	32.04 Recover from disk errors and restore lost data using recovery tools.
33.0	Configure and troubleshoot network connections. The student will be able to:
	33.01 Install and configure network adapters and drivers.
	33.02 Configure IP addressing (IPv4 and IPv6), subnet masks, and gateways.
	33.03 Test and troubleshoot LAN and WLAN connections using appropriate tools.
	33.04 Configure VPN clients and remote access solutions.
	33.05 Identify and resolve common network protocol issues (DNS, DHCP, HTTP, SMB).
34.0	Implement and troubleshoot system and network security. The student will be able to:
	34.01 Apply operating-system security settings, local policies, and account management.
	34.02 Configure and troubleshoot file and folder permissions and encryption (EFS, BitLocker).
	34.03 Enable auditing and review security logs.
	34.04 Implement antivirus, firewall, and endpoint protection solutions.
	34.05 Apply principles of least privilege and password/MFA policies.
35.0	Demonstrate effective communication in technical environments. The student will be able to:
	35.01 Communicate technical information clearly to non-technical users in oral and written form.
	35.02 Document troubleshooting steps and solutions using industry-standard templates.
	35.03 Deliver informal presentations or training to colleagues on IT topics.
	35.04 Use professional tone and grammar in all correspondence (tickets, chat, email).
36.0	Apply critical thinking and problem-solving skills. The student will be able to:
	36.01 Use structured troubleshooting models (CompTIA A+ 6-step process) to diagnose issues.
	36.02 Collaborate with team members to resolve complex technical problems.
	36.03 Conduct research using technical documentation and vendor resources.
	36.04 Track and analyze patterns in recurring issues to develop preventive solutions.

37.0	Use information technology tools to enhance productivity and collaboration. The student will be able to:
	37.01 Utilize IT asset-management and ticketing systems to record and track incidents.
	37.02 Use office productivity applications (Google Workspace, Microsoft 365) for documentation and reporting.
	37.03 Leverage remote-support and collaboration tools (Teams, Zoom, Slack) to assist users and teams.
	37.04 Apply version-control and file-management best practices for shared projects.
38.0	Describe organizational roles and team dynamics in IT environments. The student will be able to:
	38.01 Explain the structure and function of IT departments within an organization.
	38.02 Describe cross-functional collaboration between help desk, network, and security teams.
	38.03 Discuss quality assurance and continuous improvement processes in IT support.
	38.04 Identify how global and cloud technologies impact modern IT operations.
39.0	Demonstrate professional ethics and legal responsibilities in IT support. The student will be able to:
	39.01 Apply ethical decision-making when handling confidential data and user information.
	39.02 Recognize and comply with organizational policies and relevant laws (HIPAA, FERPA, GDPR).
	39.03 Describe the long-term consequences of unethical or illegal behavior in technology fields.
	39.04 Demonstrate responsible use of digital resources and adherence to acceptable-use policies.
Course Number: CTS0027 Occupational Completion Point: D Systems Administrator – 150 Hours	
40.0	Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance. The student will be able to:
	40.01 Communicate professionally and diplomatically with customers and end users to resolve technical issues efficiently.
	40.02 Demonstrate ethical decision-making and confidential data-handling in IT environments.
41.0	Participate in work-based learning experiences. The student will be able to:
	41.01 Participate in simulated system-administration projects using ticketing and change-management tools.
	41.02 Discuss the role of technology in enterprise operations and IT service delivery.
	41.03 Demonstrate basic supervisory and project-coordination skills in a team environment.
42.0	Administer accounts and resources on computers running server operating systems. The student will be able to:
	42.01 Identify core roles and features of modern server operating systems (Windows Server 2022+, Linux Server distributions).

	42.02 Install and configure administrative tools (Active Directory Users and Computers, Server Manager, Remote Server Administration Tools).
	42.03 Create and manage user, group, and computer accounts.
	42.04 Organize resources within organizational units (OUs) for delegated administration.
43.0	Modify and manage directory objects. The student will be able to:
	43.01 Modify user and computer properties, enable and unlock accounts, and reset credentials.
	43.02 Locate directory objects using queries and PowerShell filters.
	43.03 Move and restore objects between organizational units and domains.
44.0	Perform administrative functions using groups. The student will be able to:
	44.01 Create and manage security and distribution groups.
	44.02 Assign permissions and roles through group membership.
	44.03 Apply best practices for group nesting and role-based access control (RBAC).
45.0	Manage access to resources and permissions. The student will be able to:
	45.01 Configure NTFS and share permissions for files and folders.
	45.02 Evaluate effective permissions and resolve conflicts.
	45.03 Implement access-based enumeration and offline files for remote users.
46.0	Implement printing and device management in a network environment. The student will be able to:
	46.01 Deploy printers using Group Policy or Universal Print services.
	46.02 Manage driver packages and printing permissions.
	46.03 Monitor and troubleshoot print queues and print servers.
47.0	Delegate administrative control and manage organizational units. The student will be able to:
	47.01 Plan OU hierarchies based on administrative and security requirements.
	47.02 Delegate control safely and audit delegated rights.
	47.03 Modify permissions for Active Directory objects following principle of least privilege.
48.0	Implement Group Policy and centralized configuration management. The student will be able to:
	48.01 Create and link Group Policy Objects (GPOs) to OUs and domains.
	48.02 Configure logon/logoff scripts and folder redirection.
	48.03 Implement security templates and administrative policies.

49.0	Manage computer and server security. The student will be able to:
	49.01 Apply security baselines and use Microsoft Security Compliance Toolkit or Linux CIS Benchmarks.
	49.02 Configure audit policies and analyze security logs.
	49.03 Implement firewall rules, antivirus, and endpoint protection solutions.
	49.04 Test and document security controls to ensure compliance.
50.0	Administer servers remotely. The student will be able to:
	50.01 Configure remote administration using RDP, PowerShell Remoting, or SSH.
	50.02 Secure remote sessions through encryption and multi-factor authentication.
	50.03 Manage remote services and scheduled tasks.
51.0	Monitor and analyze server performance. The student will be able to:
	51.01 Establish performance baselines and utilize Performance Monitor and Resource Monitor.
	51.02 Create and analyze performance logs and alerts.
	51.03 Use Task Manager and Event Viewer to detect anomalies.
52.0	Collect performance data and identify system bottlenecks. The student will be able to:
	52.01 Monitor CPU, memory, disk I/O, and network subsystems.
	52.02 Interpret counters and thresholds to identify bottlenecks.
	52.03 Recommend optimization or scaling solutions based on data.
53.0	Maintain device drivers and hardware compatibility. The student will be able to:
	53.01 Install and update drivers through Windows Update or vendor repositories.
	53.02 Roll back or restore previous drivers if compatibility issues occur.
54.0	Configure and manage disks and volumes. The student will be able to:
	54.01 Initialize, partition, and format storage devices.
	54.02 Create and extend volumes, mount points, and storage pools.
	54.03 Convert between basic and dynamic disks.
	54.04 Implement Storage Spaces and RAID redundancy.
55.0	Secure data through encryption and quotas. The student will be able to:
	55.01 Apply file compression and disk encryption (BitLocker, LUKS).

	55.02 Configure file encryption (EFS) and access control policies.
	55.03 Set and manage disk quotas to control storage usage.
56.0	Plan for and perform disaster recovery and business continuity. The student will be able to:
	56.01 Develop backup strategies using Windows Server Backup or third-party solutions.
	56.02 Schedule and verify incremental and full backups.
	56.03 Implement volume shadow copies and file version restoration.
	56.04 Perform bare-metal recovery and system state restores.
57.0	Manage software updates and patch management. The student will be able to:
	57.01 Deploy updates using Windows Server Update Services (WSUS), Intune, or Linux repositories.
	57.02 Automate patch approval and reporting.
	57.03 Validate update compliance and rollback failed deployments.
58.0	Configure IP addressing and troubleshoot address issues. The student will be able to:
	58.01 Convert IP Addresses from decimal to binary.
	58.02 Calculate a subnet mask.
	58.03 Create subnets using VLSM and CIDR.
	58.04 Isolate addressing issues associated with the IP routing process.
59.0	Configure an Internet protocol (IP) address for client computers. The student will be able to:
	59.01 Plan IPv4/IPv6 addressing schemes using VLSM and CIDR.
	59.02 Configure static and dynamic addresses.
	59.03 Identify and resolve routing and addressing conflicts.
60.0	Implement name resolution and DNS services. The student will be able to:
	60.01 Install and configure DNS servers and zones.
	60.02 Configure forwarders, conditional forwarding, and dynamic updates.
	60.03 Troubleshoot DNS records and caching issues using nslookup and PowerShell.
61.0	Configure routing, remote access, and VPN connectivity. The student will be able to:
	61.01 Implement Routing and Remote Access Services (RRAS) or Linux routing.
	61.02 Configure VPN connections (IPsec, SSL, or L2TP).

	61.03 Centralize authentication through RADIUS or Network Policy Server (NPS).
62.0	Install and configure client operating systems. The student will be able to:
	62.01 Deploy and upgrade client OS images using MDT or WDS.
	62.02 Automate installations with unattended files or deployment scripts.
	62.03 Configure domain joins and post-installation settings.
63.0	Configure and support remote and mobile users. The student will be able to:
	63.01 Configure Remote Desktop, VPN, and cloud workspace access.
	63.02 Implement authentication and encryption protocols for remote connections.
	63.03 Support mobile devices using Intune or Mobile Device Management (MDM).
64.0	Monitor resources and system performance. The student will be able to:
	64.01 Collect system information using Task Manager, Performance Monitor, and Resource Monitor.
	64.02 Analyze event logs for system and application errors.
	64.03 Use automated maintenance and optimization tools.
65.0	Demonstrate the importance of health, safety, and environmental management systems. The student will be able to:
	65.01 Follow safe electrical and ergonomic work practices when handling equipment.
	65.02 Describe emergency procedures and incident reporting requirements.
	65.03 Create a disaster or emergency response plan for IT operations.
66.0	Demonstrate leadership and teamwork skills. The student will be able to:
	66.01 Apply leadership principles to coordinate system projects and mentorship.
	66.02 Collaborate effectively within technical and cross-department teams.
	66.03 Conduct and document meetings to achieve team goals.
67.0	Explain employability and entrepreneurship skills. The student will be able to:
	67.01 Demonstrate positive work behaviors and professional attitudes.
	67.02 Develop a career plan including industry certifications.
	67.03 Research employment and entrepreneurial opportunities in systems administration.
	67.04 Maintain a career portfolio and continuing-education record.

Course Number: CTS0028 Occupational Completion Point: E Systems Engineer – 150 Hours	
68.0	Apply communication skills (reading, writing, speaking, listening, viewing) in a courteous, concise, and correct manner on personal and professional levels. The student will be able to:
68.01	Communicate complex technical information clearly to technical and non-technical audiences using written, oral, and visual formats.
68.02	Document configuration procedures, incident reports, and project summaries using professional IT communication standards.
69.0	Participate in work-based learning experiences. The student will be able to:
69.01	Participate in simulated enterprise environments using ticketing, monitoring, and documentation systems.
69.02	Demonstrate the use of modern network-management and automation tools.
69.03	Compare and evaluate software and cloud-based applications used in systems administration and support.
70.0	Plan a network infrastructure. The student will be able to:
70.01	Design scalable and redundant network topologies.
70.02	Plan and document test environments for configuration and staging.
70.03	Utilize management and monitoring tools for lifecycle maintenance.
70.04	Identify technologies and services implemented in modern LAN, WAN, and cloud networks.
71.0	Plan and optimize a TCP/IP physical and logical network. The student will be able to:
71.01	Explain the TCP/IP model and IPv4/IPv6 addressing schemes.
71.02	Design IP addressing, subnetting, and VLSM plans.
71.03	Optimize network performance using QoS, VLAN segmentation, and redundancy protocols.
72.0	Plan and troubleshoot routing. The student will be able to:
72.01	Explain routing concepts and protocols (static, RIP, OSPF, BGP).
72.02	Develop and implement secure routing strategies.
72.03	Use routing diagnostic tools (ping, traceroute, netstat, pathping).
72.04	Troubleshoot dynamic and static routing issues.
73.0	Plan a DHCP strategy. The student will be able to:
73.01	Explain DHCP operation in enterprise networks.
73.02	Design IP scope and reservation strategies for LAN and VLAN segments.
73.03	Secure DHCP deployment through logging and access control.

74.0	Plan a DNS strategy. The student will be able to:
	74.01 Design namespace and zoning schemes supporting Active Directory and cloud integration.
	74.02 Configure primary and secondary zones with redundant replication.
	74.03 Deploy DNS security extensions (DNSSEC) to ensure integrity.
	74.04 Plan internal and external DNS resolution strategies.
75.0	Optimize and troubleshoot DNS. The student will be able to:
	75.01 Optimize DNS server performance and query response times.
	75.02 Monitor zone replication and server-to-server communications.
	75.03 Configure client-side DNS settings for enterprise efficiency.
	75.04 Troubleshoot name-resolution and connectivity issues using diagnostic tools.
76.0	Plan and troubleshoot IPsec and network security. The student will be able to:
	76.01 Explain IPsec protocols (AH, ESP) and their use in VPNs.
	76.02 Configure secure IPsec policies and rules in enterprise networks.
	76.03 Integrate IPsec with modern VPN technologies and cloud tunnels.
	76.04 Troubleshoot IPsec tunnel connectivity and encryption issues.
77.0	Plan network access. The student will be able to:
	77.01 Select appropriate wired and wireless access methods for users and devices.
	77.02 Develop remote-access and Zero-Trust Network Access (ZTNA) strategies.
	77.03 Implement RADIUS, TACACS+, and certificate-based authentication.
	77.04 Design a secure network-access and authorization plan.
78.0	Troubleshoot network access. The student will be able to:
	78.01 Use diagnostic utilities and logs to resolve connectivity issues.
	78.02 Troubleshoot wired and wireless authentication failures.
	78.03 Diagnose LAN segmentation or VLAN misconfigurations.
	78.04 Resolve remote-access and VPN issues.
79.0	Analyze global director infrastructure. The student will be able to:
	79.01 Describe Active Directory and Lightweight Directory Access Protocol (LDAP) architectures.

	79.02 Use administrative tools to analyze directory components.
	79.03 Plan and document directory design and replication requirements.
80.0	Implement directory and domain structure. The student will be able to:
	80.01 Create forests, domains, and organizational trusts.
	80.02 Configure DNS integration within directory services.
	80.03 Manage functional levels and domain relationships.
	80.04 Secure trust relationships using filtering and conditional access.
81.0	Implement organizational unit (O.U.) structures. The student will be able to:
	81.01 Create and organize O.U.s based on administrative roles and locations.
	81.02 Delegate permissions and control within O.U. hierarchies.
	81.03 Plan O.U. design to align with enterprise policy and security requirements.
82.0	Implement user, group, and computer accounts. The student will be able to:
	82.01 Create and manage accounts using Active Directory and automation tools such as PowerShell.
	82.02 Implement naming conventions and UPN suffixes.
	82.03 Move objects within and across domains while preserving permissions.
	82.04 Plan and audit account policies and lifecycle management.
83.0	Implement Group Policy and access management. The student will be able to:
	83.01 Create and configure Group Policy Objects (GPOs).
	83.02 Apply GPOs to users, computers, and O.U.s appropriately.
	83.03 Troubleshoot and verify Group Policy application.
	83.04 Delegate administrative control of Group Policies.
	83.05 Plan policy hierarchies to support compliance and security.
84.0	Deploy and manage software and updates through policy. The student will be able to:
	84.01 Explain modern software deployment concepts using Group Policy and Endpoint Management.
	84.02 Deploy applications using GPOs, MSI packages, or cloud management tools (Intune, SCCM).
	84.03 Manage updates and patches across enterprise devices.
	84.04 Troubleshoot software deployment and update failures.

	84.05 Plan a software deployment and maintenance strategy.
85.0	Implement sites and replication strategies. The student will be able to:
	85.01 Explain Active Directory replication processes and components.
	85.02 Create and configure sites and subnets for replication control.
	85.03 Monitor and troubleshoot replication failures.
	85.04 Design a site strategy based on bandwidth and security requirements.
86.0	Implement domain-controller placement and resilience. The student will be able to:
	86.01 Plan domain-controller and global-catalog placement across sites.
	86.02 Determine replication frequency and monitoring strategies.
	86.03 Design fault-tolerant domain-controller layouts for high availability.
87.0	Design and apply a security framework. The student will be able to:
	87.01 Describe core elements of enterprise security policies and procedures.
	87.02 Develop a security design framework based on industry standards (NIST, CIS, ISO 27001).
	87.03 Form a security planning and implementation team.
88.0	Recognize and predict common threats by using a threat model. The student will be able to:
	88.01 Explain modern vulnerabilities and attack vectors (phishing, malware, insider threats).
	88.02 Apply threat modeling methodologies such as STRIDE or MITRE ATT&CK to anticipate risks.
89.0	Apply risk management principles. The student will be able to:
	89.01 Explain risk assessment and treatment methods.
	89.02 Develop a risk management plan including impact analysis and mitigation controls.
90.0	Design security for physical resources. The student will be able to:
	90.01 Assess threats to facilities and equipment.
	90.02 Design physical security controls (environmental, access, video monitoring, locks).
91.0	Design security for computers and endpoints. The student will be able to:
	91.01 Analyze and mitigate endpoint vulnerabilities (antivirus, EDR, HIDS).
	91.02 Design hardening standards for servers and workstations.
92.0	Design security for accounts and identities. The student will be able to:

	92.01 Assess account privilege risks and apply least-privilege principles.
	92.02 Design account protection using multi-factor authentication and conditional access.
93.0	Design security for authentication and access control. The student will be able to:
	93.01 Evaluate authentication threats and develop identity protection strategies.
	93.02 Design role-based and policy-based access control mechanisms.
94.0	Design security for data and storage. The student will be able to:
	94.01 Identify data classification levels and associated risks.
	94.02 Design data protection and encryption strategies for storage systems and cloud resources.
95.0	Design security for data transmission. The student will be able to:
	95.01 Analyze risks to data in transit and apply secure protocols (TLS, SSH, HTTPS).
	95.02 Design encryption and tunneling methods for data communication.
96.0	Design security for network perimeters and edge devices. The student will be able to:
	96.01 Identify threats to network perimeters and edge infrastructure.
	96.02 Design segmentation and defense-in-depth architectures using firewalls and IDS/IPS.
97.0	Design an audit policy and an incident response procedure. The student will be able to:
	97.01 Explain the importance of auditing, logging, and incident response.
	97.02 Develop an audit policy and retention plan.
	97.03 Create an incident-response and post-incident review procedure.
98.0	Linux Foundation. The student will be able to:
	98.01 Explain the evolution and philosophy of Linux and open-source software.
	98.02 Differentiate between common distributions and their enterprise roles.
	98.03 Describe the GNU General Public License (GPL) and Free/Open Source Software (FOSS) concepts.
	98.04 Identify Linux roles in server, network, and cloud environments.
99.0	Linux Fundamentals. The student will be able to:
	99.01 Access and use the command line shell.
	99.02 Utilize sudo and root privileges safely.
	99.03 Use text editors (vi, nano) and manual pages for reference.

	99.04 Manage environment variables and shell profiles.
	99.05 Perform redirection, piping, and process control.
	99.06 Manage files, links, and directory structures based on the Filesystem Hierarchy Standard.
	99.07 Compress, archive, and extract files using standard utilities.
100.0	Linux installation and configuration. The student will be able to:
	100.01 Plan and perform Linux installation including partitioning and LVM.
	100.02 Install server and desktop distributions in bare-metal or virtual environments.
	100.03 Configure boot loaders and startup parameters (GRUB2).
101.0	Linux Systems Operation. The student will be able to:
	101.01 Manage processes and services using systemd.
	101.02 Monitor resource usage and update software packages.
	101.03 Mount and unmount volumes and shared storage.
	101.04 Manage libraries and dependencies.
102.0	Linux users, groups, and permissions. The student will be able to:
	102.01 List, create, and manage local users and groups.
	102.02 Explain the use of the /etc/passwd and /etc/shadow files and their security implications.
	102.03 Assign users to groups and manage group memberships.
	102.04 Explain Linux file and folder ownership, permissions, and inheritance.
	102.05 Change ownership and group ownership using chown and chgrp.
	102.06 Interpret and modify file permissions using symbolic and octal (binary) notation.
	102.07 Demonstrate read, write, and execute permissions and how they affect system security.
	102.08 Apply and remove special permissions (setuid, setgid, sticky bit).
	102.09 Implement basic access-control lists (ACLs) to extend standard permissions.
103.0	Linux Basic Security and System Monitoring. The student will be able to:
	103.01 Configure IPv4 and IPv6 interfaces manually and with NetworkManager.
	103.02 Deploy and manage firewall rules using iptables or nftables.
	103.03 Monitor and analyze log files using tail, less, grep, journalctl, and logrotate.

103.04 Back up and restore critical system and security logs.
103.05 Write and schedule scripts with bash and cron to automate administrative tasks.
103.06 Harden systems by disabling unnecessary services and closing unused ports.
103.07 Implement fail2ban or equivalent intrusion-prevention software for brute-force protection.
103.08 Explain and apply the principle of least privilege on Linux systems.
Course Number: CTS0029 **Occupational Completion Point: F** **Wireless Network Administrator – 150 Hours**
104.0 Participate in simulated work-based learning experiences. The student will be able to:
104.01 Participate in simulated wireless network support tasks including installation, configuration, and troubleshooting of WLAN components.
104.02 Use network monitoring and documentation tools to log maintenance activities and technical findings.
104.03 Demonstrate effective communication, teamwork, and customer service within a wireless support environment.
105.0 Demonstrate proficiency in applying radio frequency (RF) technologies. The student will be able to:
105.01 Define and apply basic RF behavior concepts including frequency, amplitude, wavelength, and signal attenuation.
105.02 Explain antenna types (omnidirectional, directional, sector, patch) and their uses in various wireless environments.
105.03 Identify components affecting RF transmission such as gain, reflection, absorption, and interference.
105.04 Describe spread-spectrum techniques including DSSS, OFDM, and MIMO as used in modern Wi-Fi standards.
105.05 Explain channel bonding, bandwidth allocation, and modulation schemes (QAM, OFDMA).
105.06 Identify FCC regulations governing wireless transmissions including frequency bands, channel spacing, and power limits.
105.07 Recognize common interference sources (Bluetooth, microwave, IoT) and recommend mitigation strategies.
106.0 Develop an awareness of wireless LAN technologies. The student will be able to:
106.01 Explain IEEE 802.11 a/b/g/n/ac/ax/be standards and their relative speeds, frequencies, and capabilities.
106.02 Describe authentication and association processes between clients and access points.
106.03 Define SSID, BSSID, ESS, and describe client roaming between access points.
106.04 Explain power management features and their impact on battery life and performance.
106.05 Differentiate between infrastructure, ad hoc, mesh, and cloud-managed WLAN architectures.

107.0	Perform implementation and management activities. The student will be able to:
107.01	Determine where wireless LAN technology is suitable based on coverage and performance requirements.
107.02	Install, configure, and manage wireless access points, controllers, and cloud-based WLAN systems.
107.03	Configure and manage wireless LAN client devices and adapters.
107.04	Install and secure wireless LAN gateways and bridges for inter-network connectivity.
107.05	Identify antenna attributes such as gain, beamwidth, and polarization for proper deployment.
107.06	Plan antenna placement and alignment for optimal coverage and minimal interference.
107.07	Calculate free-space path loss and apply basic link-budget concepts.
107.08	Identify and manage WLAN accessories (PoE injectors, cabling, mounting hardware).
107.09	Diagnose and correct common WLAN challenges such as multipath, reflection, and absorption.
107.10	Explain how antenna diversity and MIMO technologies improve reliability and throughput.
107.11	Conduct a wireless site survey to assess coverage, capacity, and interference.
107.12	Identify required tools and equipment for predictive and active RF site surveys.
107.13	Perform site surveys and document findings with signal maps and heatmaps.
107.14	Analyze results and provide site-survey reports with recommendations.
108.0	Develop an awareness of wireless security systems. The student will be able to:
108.01	Compare wireless security protocols (WEP, WPA2, WPA3) and their relative strengths and weaknesses.
108.02	Identify common WLAN security threats including rogue APs, Evil Twin, deauthentication, and packet sniffing attacks.
108.03	Implement security features such as 802.1X authentication, RADIUS integration, and encryption.
108.04	Apply corporate wireless security policies including password, encryption, and network segmentation standards.
108.05	Use wireless analyzers to detect unauthorized devices and validate network compliance.
109.0	Demonstrate knowledge of wireless industry standards. The student will be able to:
109.01	Differentiate between 2.4 GHz, 5 GHz, and 6 GHz frequency bands, including channel widths and limitations.
109.02	Identify key industry organizations including IEEE, Wi-Fi Alliance, FCC, and IETF, and their roles in WLAN standardization.
109.03	Explain the differences between ISM and UNII bands and their permitted applications.
109.04	Describe power-output regulations and antenna-alignment requirements for point-to-point and point-to-multipoint links.

Course Number: EEV0317 **Occupational Completion Point: G** **Data Communications Analyst – 150 Hours**
110.0 Participate in simulated work-based learning experiences. The student will be able to:
110.01 Participate in simulated network support activities using help-desk or ticketing systems.
110.02 Use collaboration and documentation platforms to record network incidents and service tasks.
110.03 Demonstrate professional and supervisory skills appropriate for a network support environment.
111.0 Demonstrate a knowledge of general security concepts. The student will be able to:
111.01 Describe access-control models (MAC, DAC, RBAC, Zero Trust).
111.02 Explain authentication and authorization processes (MFA, SSO, identity providers).
111.03 Identify common cyberattacks (phishing, DDoS, spoofing, social engineering, insider threats).
111.04 Harden endpoints by disabling unused services and enforcing secure configuration baselines.
111.05 Recognize and mitigate malware types (viruses, worms, Trojans, ransomware).
111.06 Configure system auditing, logging, and vulnerability scanning to support incident response.
112.0 Develop an awareness of communication security concepts. The student will be able to:
112.01 Configure secure remote-access solutions (VPN, RADIUS, L2TP, SAML, ZTNA).
112.02 Identify email-security risks (spam, spoofing, malicious attachments) and apply mitigation techniques.
112.03 Explain web and application-security concepts (HTTPS, TLS certificates, content filtering).
112.04 Demonstrate secure file-transfer methods (SFTP, FTPS, encrypted cloud storage).
112.05 Describe wireless-security protocols (WPA3, 802.1X) and common vulnerabilities.
113.0 Develop an awareness of network infrastructure security. The student will be able to:
113.01 Install and configure firewalls and access-control lists to protect network segments.
113.02 Identify physical and signal security considerations for copper and fiber media.
113.03 Secure removable media and external devices through encryption and policy controls.
113.04 Describe secure network topologies (DMZ, security zones, NAT, micro-segmentation).
113.05 Deploy and monitor intrusion-detection and prevention systems (IDS/IPS).
113.06 Maintain security baselines through updates, patch management, and configuration control.
113.07 Configure Virtual Private Networks (VPNs) for secure remote connectivity.

	113.08 Explain the role of NAT, firewall rules, and routing policies in network security.
114.0	Develop an awareness of cryptography and its relation to security. The student will be able to:
	114.01 Explain modern encryption algorithms (AES, RSA, ECC) and hash functions (SHA-3).
	114.02 Use digital certificates and PKI to authenticate users and devices.
	114.03 Describe cryptographic standards and protocols used in secure commerce (SSL/TLS, tokenization, digital signatures).
115.0	Incorporate organizational and operational security in an appropriate and effective manner. The student will be able to:
	115.01 Develop and apply a network-security policy and incident-response procedures.
	115.02 Implement physical security controls (badges, locks, cameras, secure racks).
	115.03 Establish and test backup and disaster-recovery plans.
	115.04 Explain business-continuity principles and their relationship to network resilience.
	115.05 Describe acceptable-use, password, and remote-access policies within an organization.
	115.06 Apply privilege management and role-based access to systems and data.
	115.07 Describe digital-forensics concepts related to incident response and evidence handling.
	115.08 Promote security-awareness training for employees and supervisors.
	115.09 Document security standards, procedures, and change-management records.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Game/Simulation/Animation Visual Design**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	B082100	
CIP Number	0550041114	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of project-based courses that provide coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster such as Game or Simulation Designer, Game or Simulation Graphic Artist, and Game or Simulation 3-D Animator; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, 2D/3D animation design and production, and implementation issues. Specialized skills involving graphic animation software are used to produce a variety of two and three dimensional components.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIG0070	Game/Simulation Designer	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @7 7G DIGI MEDIA 7G COMP PROG 7G	300 hours
B	DIG0071	Game/Simulation Graphic Artist		150 hours
C	DIG0072	Game/Simulation 3D Animator		150 hours

Note: OTA0040 is a highly recommended core.

Program Recommendations

The Game, Simulation and Animation Visual program emphasizes the development of technical abilities as well as ethical and societal awareness necessary to function in a highly technological society. The use of cooperative learning groups is recommended. By learning and practicing group process skills, students will be prepared to work "together" in real work situations. Program graduates will develop enhanced self-esteem as well as the problem solving and teamwork skills necessary to succeed in careers and postsecondary education.

The Game, Simulation and Animation Visual Design program places a strong emphasis on workplace learning. Job shadowing and mentoring experiences with game and simulation professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.

The Foundations and Design courses should be taken in sequence prior to the 2D Graphic Development and 3D Graphic Animation courses. The 2D Graphic Development and 3D Graphic Animation courses may be taken concurrently.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify commonly used art and animation production tools in the game design industry.
02.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
03.0 Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development.
04.0 Identify tools and software commonly used in game development.
05.0 Investigate career opportunities in the game industry.
06.0 Demonstrate research and information fluency.
07.0 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
08.0 Explore the methods used to create and sustain player immersion.
09.0 Describe the game development life cycle.
10.0 Demonstrate the professional level of written and oral communication required in the game development industry.
11.0 Understand the core tasks and challenges that face a video game design team.
12.0 Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives.
13.0 Create a working game or simulation as part of a team.
14.0 Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game.
15.0 Categorize the different gaming genres.
16.0 Identify popular games and identify commonality between them.
17.0 Understand the general procedure and requirements of game design.
18.0 Understand the general principles of storytelling for game design.
19.0 Understand character archetypes and character design.
20.0 Develop a game design document.
21.0 Understand the process of creating and designing player choice and other game designer strategy considerations.
22.0 Create and design the game flow as it relates to story and plot.
23.0 Assess common principles and procedures in game flow design.
24.0 Describe player challenge rule creation elements.
25.0 Understand the use of inventory systems in game design.
26.0 Understand the various job titles and responsibilities of a graphic artist as it relates to the game industry.
27.0 Develop the art direction for a game.
28.0 Determine and document the graphical needs of a game using design documents including art direction and reference materials.
29.0 Understand the fundamentals of drawing and painting techniques.
30.0 Demonstrate a working knowledge of vector and paint programs used to make graphics.
31.0 Demonstrate the effective use art input devices.
32.0 Demonstrate world building, making graphics and backgrounds for side scrolling, top down, and Isometric projection.
33.0 Understand the general concepts of environmental design.
34.0 Describe how environmental design is used in conjunction with game level design.
35.0 Demonstrate knowledge of basic lighting.

36.0 Demonstrate knowledge of basic materials and textures.
37.0 Demonstrate basic understanding of modeling principles.
38.0 Demonstrate knowledge of polygon modeling.
39.0 Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling.
40.0 Demonstrate advance texturing techniques.
41.0 Understand the various job titles and responsibilities of a 3D animator as it relates to the game industry.
42.0 Understand the principles of 2D and 3D animation as it relates to game graphics (walk, run, Jump, idle).
43.0 Demonstrate a working knowledge of modeling and paint programs used to make 3D graphics and animation.
44.0 Demonstrate knowledge of basic animation.
45.0 Demonstrate knowledge of rigging.
46.0 Understand the fundamentals of facial animation.
47.0 Create a user interface.
48.0 Individually design and create a playable game.
49.0 Create particle system effects.
50.0 Individually design and create a playable game.

Florida Department of Education
Student Performance Standards

Program Title: Game, Simulation, Animation Visual Design
Career Certificate Program Number: B082100

Course Number: DIG0070 **Occupational Completion Point: A** **Game/Simulation Designer – 300 Hours**	
01.0	Identify commonly used art and animation production tools in the game design industry. The student will be able to:
	01.01 Identify, categorize and discuss art and animation tools commonly used in game design.
02.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
	02.01 Understand the use of “Fair Use and Fair Dealing”.
	02.02 Understand the transfer and licensing of creative works.
	02.03 Understand the use of “exclusive rights” to intellectual creations.
	02.04 Demonstrate the use of digital watermarking.
03.0	Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development. The student will be able to:
	03.01 Identify and demonstrate positive work behaviors needed to be employable.
	03.02 Maintain a career portfolio to document knowledge, skills, and experience.
	03.03 Evaluate and compare employment opportunities that match career goals.
	03.04 Identify and exhibit traits for retaining employment.
04.0	Identify tools and software commonly used in game development. The student will be able to:
	04.01 Identify and discuss the popular game development tools currently used in the industry.
	04.02 Identify and discuss popular gaming engines.
	04.03 Identify and discuss popular world building tools.
05.0	Investigate career opportunities in the game industry. The student will be able to:
	05.01 Describe job requirements for a variety of occupations within the game development industry.
	05.02 Identify current employment trends and career opportunities in the game industry.
06.0	Demonstrate research and information fluency. The student will be able to:
	06.01 Play games to research and collect game play data.

	06.02 Evaluate, analyze and document game styles and playability.
	06.03 Determine the dramatic elements in games, including kinds of fun, player types and nonlinear storytelling.
07.0	Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design. The student will be able to:
	07.01 Test and analyze games to determine the quality of rules, interfaces, navigation, performance, play, artistry and longevity in design and structure.
	07.02 Research and evaluate the game analysis techniques used by the video game industry.
	07.03 Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
	07.04 Evaluate professional reviews and write a critical analysis of a current video game.
08.0	Explore the methods used to create and sustain player immersion. The student will be able to:
	08.01 Research and define the term “player immersion”.
	08.02 Explore and explain the factors that create player immersion in a game.
	08.03 Examine popular games and explain the methods each game uses to increase player immersion.
09.0	Describe the game development life cycle. The student will be able to:
	09.01 Identify steps in the pre-production process including the proof of concept and market research.
	09.02 Describe the iterative prototyping process – Alpha, Beta, RTM.
	09.03 Determine platform, technology and scripting requirements.
	09.04 Implement techniques of scenario development, levels, and missions.
	09.05 Discuss game testing requirements and methods.
	09.06 Identify and describe maintenance, upgrade and sequel issues.
10.0	Demonstrate the professional level of written and oral communication required in the game development industry. The student will be able to:
	10.01 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
	10.02 Organize ideas and communicate oral and written messages appropriate for the game development industry environment.
11.0	Understand the core tasks and challenges that face a video game design team. The student will be able to:
	11.01 Identify and define the roles and responsibilities of team members on a video game design team.
	11.02 Explore and discuss methods of communications and scheduling for design teams.
12.0	Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives. The student will be able to:

	12.01 Employ leadership skills to accomplish organizational goals and objectives.
	12.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	12.03 Conduct and participate in meetings to accomplish work tasks.
	12.04 Employ mentoring skills to inspire and teach others.
13.0	Create a working game or simulation as part of a team. The student will be able to:
	13.01 Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
	13.02 Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
	13.03 Using a simple game development tool, create a game or simulation.
	13.04 Present the game or simulation.
14.0	Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game. The student will be able to:
	14.01 Use industry standard game design production documents to create a game design production plan.
15.0	Categorize the different gaming genres. The student will be able to:
	15.01 Research, compare and categorize the different gaming genres.
	15.02 Analyze examples of different gaming genres.
	15.03 Define and use the necessary vocabulary related to gaming and the different genres.
16.0	Identify popular games and identify commonality between them. The student will be able to:
	16.01 Analyze and deconstruct game environments and interactions.
	16.02 Compare and contrast the top selling video games in terms of player interaction, plot complexity, and reward.
	16.03 Categorize gameplay elements by player type (killer, talker, explorer and achiever).
17.0	Understand the general procedure and requirements of game design. The student will be able to:
	17.01 Describe the design process from conception to production.
	17.02 Explain the iterative nature of game design through the different stages of design iterations including pre-alpha, alpha, beta, release candidate, going gold and support.
	17.03 Develop design plans, for example, character sketches, documentation and storyboards for proposed games.
18.0	Understand the general principles of storytelling for game design. The student will be able to:
	18.01 Identify the essential elements of a story.
	18.02 Describe how creative writing is used as a game design tool.

	18.03 Compare and contrast methods of delivering a story in a game.
19.0	Understand character archetypes and character design. The student will be able to:
	19.01 Research and identify common character archetypes used in computer games.
	19.02 Design character prototypes to physically match archetype.
	19.03 Create character backstory and profile.
20.0	Develop a game design document. The student will be able to:
	20.01 Create a game strategy overview, character overview, and storyboard overview.
	20.02 Define the rules of play and multi-player options.
	20.03 Define strategic positioning of game immersion dynamics and psychological effect.
	20.04 Describe how game layout charts are used in game design.
	20.05 Understand the use of storyboards in the game design industry with regard to environmental illustrations, level designs, character designs, model sheets and GUI Designs.
21.0	Understand the process of creating and designing player choice and other game designer strategy considerations. The student will be able to:
	21.01 Describe the use of artificial intelligence challenges in game design and the need for giving the player rest time between challenges.
	21.02 Evaluate the impact of randomness in game design especially as it pertains to pattern recognition.
	21.03 Identify techniques used in the industry to help the player to navigate.
	21.04 Discuss the principles of player-centric design.
	21.05 Examine and discuss design elements that encourage continuous active engagement both mental and physical.
	21.06 Analyze design elements that maintain player interest and vary the degree of challenge.
	21.07 Discuss the need for a balance of design elements for the purpose of rewarding and frustrating players.
22.0	Create and design the game flow as it relates to story and plot. The student will be able to:
	22.01 Identify techniques of introducing the story plot and beginning play.
	22.02 Describe story plot development techniques for the middle of play in game design.
	22.03 Analyze and discuss planning techniques for climax and finale of games.
23.0	Assess common principles and procedures in game flow design. The student will be able to:
	23.01 Assess missions and scenarios game flow techniques.
	23.02 Describe common use of mission design and campaigns.
	23.03 Evaluate usage of static versus dynamic campaigns.

24.0	Describe player challenge rule creation elements. The student will be able to:
24.01	Research common design methods for clearing obstacles or series of obstacles.
24.02	Describe common design elements introducing skill, luck and combinations including escalating challenges to games.
24.03	Identify common design elements used to vary weapons, characters and tools.
24.04	Discuss the incorporation of risk reward and adaptive challenges (AI).
25.0	Understand the use of inventory systems in game design. The student will be able to:
25.01	Discuss the various methods of describing items in player's inventory in contemporary game design.
25.02	Review and discuss industry methods of communicating how inventory items can have an effect on game play.
Course Number: DIG0071 Occupational Completion Point: B Game/Simulation Graphic Artist – 150 Hours	
26.0	Understand the various job titles and responsibilities of a graphic artist as it relates to the game industry. The student will be able to:
26.01	Identify the job titles of graphic artist used in a game project.
26.02	Demonstrate the ability to work as part of an art team.
26.03	Perform one or more of the following roles for a game project: concept artist, art director, texture artist, environment artist.
27.0	Develop the art direction for a game. The student will be able to:
27.01	Develop a vision for visual elements of a game.
27.02	Create conceptual game art using various techniques, emphasizing space and form through range of value, placement, reflections, and shadows.
27.03	Create character sketches, architectural sketches and background sketches.
27.04	Understand the challenges of art direction as it relates to mobile devices.
28.0	Determine and document the graphical needs of a game using design documents including art direction and reference materials. The student will be able to:
28.01	Develop characters and game elements in respect to the art direction laid out in the design documents.
28.02	Determine the appropriate file format between vector based (resolution independent) vs. rasterized graphics (resolution dependent).
28.03	Understand the different aspects of quality and detail in relation to performance and size.
28.04	Understand the role of naming conventions as it applies to creative assets storage used in the work flow.
28.05	Demonstrate the effective use of alternative resolutions, scaling and file formats.

29.0	Understand the fundamentals of drawing and painting techniques. The student will be able to:
	29.01 Demonstrate the use of different techniques, format, media or style.
	29.02 Understand the use of primitives.
	29.03 Demonstrate basic understanding of composition of a scene.
	29.04 Understand the shape of the human form.
	29.05 Know the value of lights and shadows.
30.0	Demonstrate a working knowledge of vector and paint programs used to make graphics. The student will be able to:
	30.01 Know the difference between Vectors and Bitmaps.
	30.02 Demonstrate understanding of various graphic art programs.
	30.03 Utilize the programs tools and brushes.
	30.04 Know the importance of Layers.
	30.05 Identify file formats.
31.0	Demonstrate the effective use of art input devices. The student will be able to:
	31.01 Demonstrate the use of a digital tablet within a paint software application.
	31.02 Demonstrate the process of capturing textures using a digital camera.
	31.03 Demonstrate the process of importing images from a digital camera into a photo editing software application.
32.0	Demonstrate world building, making graphics and backgrounds for side scrolling, top down, and Isometric projection. The student will be able to:
	32.01 Know the importance of scale in relation to the player.
	32.02 Understand level design to successfully lead the player.
	32.03 Effectively use graphics to convey mood and story in the game world.
33.0	Understand the general concepts of environmental design. The student will be able to:
	33.01 Survey and evaluate commonly used concept art.
	33.02 Create a world sketch with particular attention to maintaining continuity of style.
	33.03 Describe the emotional/psychological aspects of environmental design that signify mood, facade of freedom, and resource struggling.
34.0	Describe how environmental design is used in conjunction with game level design. The student will be able to:
	34.01 Examine and evaluate examples of focus on a theme.
	34.02 Describe methods of creating a purposeful architecture giving consideration to continuity and themes and taking advantage of revisiting.

	34.03 Consider and discuss environmental design elements for multi-player or single player games.
	34.04 Describe the history of creating shifts in game design environments and embracing novel ideas.
	34.05 Identify and discuss environmental design pitfalls such as red herrings and cookie-cutter layouts.
35.0	Demonstrate knowledge of basic lighting. The student will be able to:
	35.01 Demonstrate an understanding of 3 point lighting (key, fill, back).
	35.02 Demonstrate an understanding of low-key and high-key lighting.
36.0	Demonstrate knowledge of basic materials and textures. The student will be able to:
	36.01 Demonstrate an understanding of material and texture storage.
	36.02 Apply textures to an object.
	36.03 Demonstrate an understanding of procedural shaders.
	36.04 Demonstrate an understanding of channels.
	36.05 Adjust the transparency, luminance, and reflection of a material.
	36.06 Demonstrate an understanding of displacement maps.
	36.07 Demonstrate an understanding of bump maps.
	36.08 Demonstrate an understanding of UV mapping.
	36.09 Demonstrate an understanding of 3D painting.
37.0	Demonstrate basic understanding of modeling principles. The student will be able to:
	37.01 Demonstrate an understanding of primitives and parametric modeling.
	37.02 Demonstrate an understanding of non-uniform rational basis spline (NURBS), splines, and polygonal modeling.
	37.03 Demonstrate the ability to use reference images and files while modeling.
38.0	Demonstrate knowledge of polygon modeling. The student will be able to:
	38.01 Demonstrate an understanding of N-gons.
	38.02 Demonstrate an understanding of subdivision.
	38.03 Demonstrate basic polygon editing and manipulation.
	38.04 Demonstrate an understanding of cutting/division tools.
	38.05 Demonstrate an understanding of extrudes.
	38.06 Demonstrate an understanding of symmetry.

	38.07 Demonstrate an understanding of basic deformers (bend, twist, melt).
39.0	Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling. The student will be able to:
	39.01 Demonstrate an understanding of points, vertices, edges, and polygons.
	39.02 Demonstrate an understanding of poly-count.
	39.03 Demonstrate an understanding of primitives.
	39.04 Locate an object's properties, attributes, and coordinates.
	39.05 Demonstrate understanding of Non uniform rational b-splines (NURBS).
	39.06 Demonstrate understanding of splines and generators (extrude, lathe, sweep).
	39.07 Understand the use of hierarchy.
	39.08 Demonstrate an understanding of Boolean objects.
	39.09 Demonstrate an understanding of Null objects.
40.0	Demonstrate advanced texturing techniques. The student will be able to:
	40.01 Create texture maps for objects in games.
	40.02 Develop 3D texture mapped objects.
Course Number: DIG0072 Occupational Completion Point: C Game/Simulation 3D Animator – 150 Hours	
41.0	Understand the various job titles and responsibilities of a 3D animator as it relates to the game industry. The student will be able to:
	41.01 Identify the job titles of a 3D animator used in a game project.
	41.02 Demonstrate the ability to work as part of an animation team.
	41.03 Perform one or more of the following roles for a game project: animator, rigger, vfx artist.
42.0	Understand the principles of 2D and 3D animation as it relates to game graphics (walk, run, Jump, idle). The student will be able to:
	42.01 Demonstrate the ability to create character and object views from which to animate.
	42.02 Break down animation into a series of pictures to import into a game engine.
	42.03 Demonstrate an understanding of the value of timing to convey character motion.
	42.04 Demonstrate the effective use of animation arcs for the articulation of body elements.
	42.05 Demonstrate the use of principles of animation such as anticipation, squash, stretch, weight, exaggeration and overlapping & secondary motion.

	42.06 Understand the use of motion capture techniques and acting principles.
43.0	Demonstrate a working knowledge of modeling and paint programs used to make 3D graphics and animation. The student will be able to:
	43.01 Understand the limitation of bitmaps images.
	43.02 Understand the use and application of bump map, normal and displacement images applied to a model.
	43.03 Demonstrate understanding of various digital content creation tools.
	43.04 Utilize the programs tools and brushes.
	43.05 Know the importance of layers.
	43.06 Identify file formats.
	43.07 Create simple shapes and structures that can be exported to games or game editors.
44.0	Demonstrate knowledge of basic animation. The student will be able to:
	44.01 Apply animation principles to object animation.
	44.02 Demonstrate an understanding of animation timelines.
	44.03 Demonstrate an understanding of key framing.
	44.04 Demonstrate an understanding in the use of controllers.
45.0	Demonstrate knowledge of rigging. The student will be able to:
	45.01 Define rigging as a process.
	45.02 Compare and contrast rigging approaches and styles.
	45.03 Demonstrate an understanding of the rig as it relates to the model.
	45.04 Demonstrate an understanding of skeletal systems.
46.0	Understand the fundamentals of facial animation. The student will be able to:
	46.01 Understand facial land marking.
	46.02 Demonstrate the ability to show emotions thru the eyes.
	46.03 Demonstrate the use of motion capture data as it applies to facial animation.
47.0	Create a user interface. The student will be able to:
	47.01 Understand good menu flow of the user interface.
	47.02 Design the ideal HUD (Heads Up Display).
48.0	Create visual effects. The student will be able to:

	48.01 Understand particle design for fire and smoke.
	48.02 Create water spray using 2D particles.
	48.03 Know the anatomy of an explosion effect.
	48.04 Create a 3D feel in a 2D world using light and shadows.
49.0	Create particle system effects. The student will be able to:
	49.01 Understand particle design for fire and smoke.
	49.02 Create water spray using 3D particles.
	49.03 Know the aspects of an explosion effect.
50.0	Individually design and create a playable game. The student will be able to:
	50.01 Use a number of computer tools to enhance and ease game programming and artistry.
	50.02 Use a game engine to create a playable game.
	50.03 Use animated objects.
	50.04 Integrate sound and music to enhance the game experience.
	50.05 Test and debug to game completion.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Game/Simulation/Animation Audio/Video Effects**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	B082200	
CIP Number	0550041115	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Game/Simulation Designer, Digital Media Artist, and Digital Media Specialist in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, audio/sound effects design and production, video/special effects design and production, and implementation issues. Specialized skills involving audio and video editing equipment and software are used to produce a variety of intrinsic and special audio/video effects.

This program is project-based and focuses on broad, transferable skills and stresses understanding and demonstration of the following rudiments of the game and simulation industry: production planning, elements of production design, storyboarding, elements of visual design, integration of digital audio and digital video into new game/simulation productions, and collaboration/teamwork.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIG0070	Game/Simulation Designer	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @7 7G DIGI MEDIA 7G COMP PROG 7G	300 hours
B	DIG0073	Digital Media Artist		150 hours
C	DIG0074	Digital Media Specialist		150 hours

*Note: OTA0040 is a highly recommended core.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify commonly used art and animation production tools in the game design industry.
02.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
03.0 Explain the importance of employability skill and entrepreneurship skills as it relates to game/simulation development.
04.0 Identify tools and software commonly used in game development.
05.0 Investigate career opportunities in the game industry.
06.0 Demonstrate research and information fluency.
07.0 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
08.0 Explore the methods used to create and sustain player immersion.
09.0 Describe the game development life cycle.
10.0 Demonstrate the professional level of written and oral communication required in the game development industry.
11.0 Understand the core tasks and challenges that face a video game design team.
12.0 Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives.
13.0 Create a working game or simulation as part of a team.
14.0 Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game.
15.0 Categorize the different gaming genres.
16.0 Identify popular games and identify commonality between them.
17.0 Understand the general procedure and requirements of game design.
18.0 Understand the general principles of storytelling for game design.
19.0 Understand character archetypes and character design.
20.0 Develop a game design document.
21.0 Understand the process of creating and designing player choice and other game designer strategy considerations.
22.0 Create and design the game flow as it relates to story and plot.
23.0 Assess common principles and procedures in game flow design.
24.0 Describe player challenge rule creation elements.
25.0 Understand the use of inventory systems in game design.
26.0 Understand the history of audio/sound effects in the entertainment industry.
27.0 Perform various job roles typical for an audio technician on a game/simulation project.
28.0 Understand intellectual property rights, copyright laws, and plagiarism as they apply to creative assets.
29.0 Demonstrate a knowledge of production writing as it relates to game and simulation design.
30.0 Demonstrate appropriate voice acting skills.
31.0 Demonstrate basic audio production.
32.0 Set-up and configure a computer for audio applications.
33.0 Operate an audio workstation.
34.0 Demonstrate application of MIDI in a game/simulation project.

35.0 Incorporate audio assets into game/simulation engine.
36.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
37.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
38.0 Explain the importance of employability skill and entrepreneurship skills.
39.0 Demonstrate personal money management concepts, procedures, and strategies.
40.0 Understand the history of video effects in the entertainment.
41.0 Understand the various job titles and responsibilities video technician as it relates to game and simulation design.
42.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
43.0 Demonstrate a knowledge of production writing as it relates to game and simulation design.
44.0 Demonstrate appropriate acting skills.
45.0 Demonstrate basic video production.
46.0 Demonstrate set-up and configuration of a computer for video applications.
47.0 Demonstrate the basic operation of a video workstation.
48.0 Incorporate video assets into game/simulation engine.

Florida Department of Education
Student Performance Standards

Program Title: Game/Simulation/Animation Audio/Video Effects
Career Certificate Program Number: B082200

Game & Simulation Creation
Instruction relating to the standards in this section should be interspersed throughout the entire course with the other standards taught progressively in the context of game design and development.

Course Number: DIG0070 **Occupational Completion Point: A** **Game/Simulation Designer – 300 Hours**	
01.0	Identify commonly used art and animation production tools in the game design industry. The student will be able to:
	01.01 Identify, categorize and discuss art and animation tools commonly used in game design.
02.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
	02.01 Understand the use of “Fair Use and Fair Dealing”.
	02.02 Understand the transfer and licensing of creative works.
	02.03 Understand the use of “exclusive rights” to intellectual creations.
	02.04 Demonstrate the use of digital watermarking.
03.0	Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development. The student will be able to:
	03.01 Identify and demonstrate positive work behaviors needed to be employable.
	03.02 Maintain a career portfolio to document knowledge, skills, and experience.
	03.03 Evaluate and compare employment opportunities that match career goals.
	03.04 Identify and exhibit traits for retaining employment.
04.0	Identify tools and software commonly used in game development. The student will be able to:
	04.01 Identify and discuss the popular game development tools currently used in the industry.
	04.02 Identify and discuss popular gaming engines.
	04.03 Identify and discuss popular world building tools.
05.0	Investigate career opportunities in the game industry. The student will be able to:
	05.01 Describe job requirements for a variety of occupations within the game development industry.

	05.02 Identify current employment trends and career opportunities in the game industry.
06.0	Demonstrate research and information fluency. The student will be able to:
	06.01 Play games to research and collect game play data.
	06.02 Evaluate, analyze and document game styles and playability.
	06.03 Determine the dramatic elements in games, including kinds of fun, player types and nonlinear storytelling.
07.0	Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design. The student will be able to:
	07.01 Test and analyze games to determine the quality of rules, interfaces, navigation, performance, play, artistry and longevity in design and structure.
	07.02 Research and evaluate the game analysis techniques used by the video game industry.
	07.03 Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
	07.04 Evaluate professional reviews and write a critical analysis of a current video game.
08.0	Explore the methods used to create and sustain player immersion. The student will be able to:
	08.01 Research and define the term “player immersion”.
	08.02 Explore and explain the factors that create player immersion in a game.
	08.03 Examine popular games and explain the methods each game uses to increase player immersion.
09.0	Describe the game development life cycle. The student will be able to:
	09.01 Identify steps in the pre-production process including the proof of concept and market research.
	09.02 Describe the iterative prototyping process – Alpha, Beta, RTM.
	09.03 Determine platform, technology and scripting requirements.
	09.04 Implement techniques of scenario development, levels, and missions.
	09.05 Discuss game testing requirements and methods.
	09.06 Identify and describe maintenance, upgrade and sequel issues.
10.0	Demonstrate the professional level of written and oral communication required in the game development industry. The student will be able to:
	10.01 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
	10.02 Organize ideas and communicate oral and written messages appropriate for the game development industry environment.
11.0	Understand the core tasks and challenges that face a video game design team. The student will be able to:
	11.01 Identify and define the roles and responsibilities of team members on a video game design team.

	11.02 Explore and discuss methods of communications and scheduling for design teams.
12.0	Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives. The student will be able to:
	12.01 Employ leadership skills to accomplish organizational goals and objectives.
	12.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	12.03 Conduct and participate in meetings to accomplish work tasks.
	12.04 Employ mentoring skills to inspire and teach others.
13.0	Create a working game or simulation as part of a team. The student will be able to:
	13.01 Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
	13.02 Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
	13.03 Using a simple game development tool, create a game or simulation.
	13.04 Present the game or simulation.
14.0	Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game. The student will be able to:
	14.01 Use industry standard game design production documents to create a game design production plan.
15.0	Categorize the different gaming genres. The student will be able to:
	15.01 Research, compare and categorize the different gaming genres.
	15.02 Analyze examples of different gaming genres.
	15.03 Define and use the necessary vocabulary related to gaming and the different genres.
16.0	Identify popular games and identify commonality between them. The student will be able to:
	16.01 Analyze and deconstruct game environments and interactions.
	16.02 Compare and contrast the top selling video games in terms of player interaction, plot complexity, and reward.
	16.03 Categorize gameplay elements by player type (killer, talker, explorer and achiever).
17.0	Understand the general procedure and requirements of game design. The student will be able to:
	17.01 Describe the design process from conception to production.
	17.02 Explain the iterative nature of game design through the different stages of design iterations including pre-alpha, alpha, beta, release candidate, going gold and support.
	17.03 Develop design plans, for example, character sketches, documentation and storyboards for proposed games.
18.0	Understand the general principles of storytelling for game design. The student will be able to:

	18.01 Identify the essential elements of a story.
	18.02 Describe how creative writing is used as a game design tool.
	18.03 Compare and contrast methods of delivering a story in a game.
19.0	Understand character archetypes and character design. The student will be able to:
	19.01 Research and identify common character archetypes used in computer games.
	19.02 Design character prototypes to physically match archetype.
	19.03 Create character backstory and profile.
20.0	Develop a game design document. The student will be able to:
	20.01 Create a game strategy overview, character overview, and storyboard overview.
	20.02 Define the rules of play and multi-player options.
	20.03 Define strategic positioning of game immersion dynamics and psychological effect.
	20.04 Describe how game layout charts are used in game design.
	20.05 Understand the use of storyboards in the game design industry with regard to environmental illustrations, level designs, character designs, model sheets and GUI Designs.
21.0	Understand the process of creating and designing player choice and other game designer strategy considerations. The student will be able to:
	21.01 Describe the use of artificial intelligence challenges in game design and the need for giving the player rest time between challenges.
	21.02 Evaluate the impact of randomness in game design especially as it pertains to pattern recognition.
	21.03 Identify techniques used in the industry to help the player to navigate.
	21.04 Discuss the principles of player-centric design.
	21.05 Examine and discuss design elements that encourage continuous active engagement both mental and physical.
	21.06 Analyze design elements that maintain player interest and vary the degree of challenge.
	21.07 Discuss the need for a balance of design elements for the purpose of rewarding and frustrating players.
22.0	Create and design the game flow as it relates to story and plot. The student will be able to:
	22.01 Identify techniques of introducing the story plot and beginning play.
	22.02 Describe story plot development techniques for the middle of play in game design.
	22.03 Analyze and discuss planning techniques for climax and finale of games.
23.0	Assess common principles and procedures in game flow design. The student will be able to:
	23.01 Assess missions and scenarios game flow techniques.

	23.02 Describe common use of mission design and campaigns.
	23.03 Evaluate usage of static versus dynamic campaigns.
24.0	Describe player challenge rule creation elements. The student will be able to:
	24.01 Research common design methods for clearing obstacles or series of obstacles.
	24.02 Describe common design elements introducing skill, luck and combinations including escalating challenges to games.
	24.03 Identify common design elements used to vary weapons, characters and tools.
	24.04 Discuss the incorporation of risk reward and adaptive challenges (AI).
25.0	Understand the use of inventory systems in game design. The student will be able to:
	25.01 Discuss the various methods of describing items in player's inventory in contemporary game design.
	25.02 Review and discuss industry methods of communicating how inventory items can have an effect on game play.
Course Number: DIG0073 Occupational Completion Point: B Digital Media Artist – 150 Hours	
26.0	Understand the history of audio/sound effects in the entertainment industry. The student will be able to:
	26.01 Discuss the role of sound in a visual presentation.
	26.02 Describe how audio/sound effects can establish or reinforce the mood.
	26.03 Explain the importance of production value.
	26.04 Describe the evolution of audio/sound effects production.
	26.05 Identify the technology incorporated into the production of sound.
27.0	Perform various job roles typical for an audio technician on a game/ simulation project. The student will be able to:
	27.01 Identify the job titles of audio technicians and artists typically involved in a game project.
	27.02 Work as part of a sound design team.
	27.03 Perform the role of the sound designer for a game/simulation project.
	27.04 Perform the role of music supervisor for a game/simulation project.
	27.05 Perform the role of Foley artist for a game/simulation project.
	27.06 Perform the role of voice actor for a game/simulation project.
	27.07 Perform the role of recording engineer for a game/simulation project.

	27.08 Perform the role of sound editor for a game/simulation project.
	27.09 Perform the role of composer/arranger for a game/simulation project.
28.0	Understand intellectual property rights, copyright laws, and plagiarism as they apply to creative assets. The student will be able to:
	28.01 Compare and contrast the doctrines of fair use and fair dealing.
	28.02 Describe the transfer and licensing of creative works.
	28.03 Explain the use of “exclusive rights” to intellectual creations.
	28.04 Use digital watermarking to embed copyright information in an audio file.
29.0	Demonstrate a knowledge of production writing as it relates to game and simulation design. The student will be able to:
	29.01 Explain the job of a scriptwriter and outline the elements of a script.
	29.02 Breakdown a script into audio production elements.
	29.03 Write simple dialog.
	29.04 Translate script elements into lyrics for a theme song.
	29.05 Write narration or instructions for game/simulation.
30.0	Demonstrate appropriate voice acting skills. The student will be able to:
	30.01 Read aloud in a professional manner.
	30.02 Receive and properly act upon direction given by the producer/director.
	30.03 Understand the concept of voice acting and playing a role while speaking.
	30.04 Perform various voice acting assignments in a professional manner according to industry standards.
31.0	Demonstrate basic audio production. The student will be able to:
	31.01 Describe digital audio storage concepts and digital storage media.
	31.02 Operate digital recording decks and other digital storage devices.
	31.03 Describe the function and operation of digital audio workstations.
	31.04 Edit, cut, erase, and insert sound utilizing various digital production techniques.
	31.05 Perform digital noise reduction and noise extraction via spectral display.
32.0	Set-up and configure a computer for audio applications. The student will be able to:
	32.01 Install basic peripheral devices related to audio programs.
	32.02 Install and configure software related to audio programs.

	32.03 Demonstrate basic knowledge of computer system requirements.
	32.04 Install plug-ins or additional audio source material such as beats and or samples.
	32.05 Diagram the signal flow of a digital audio workstation.
33.0	Operate an audio workstation. The student will be able to:
	33.01 Demonstrate knowledge of the digital audio workstation interface.
	33.02 Create and arrange a multi-track project.
	33.03 Create interest and effect using editing techniques.
	33.04 Design and edit audio using a waveform editor.
	33.05 Record audio directly to the digital audio workstation.
	33.06 Mix audio.
	33.07 Demonstrate skill in using audio effects and plug-ins.
	33.08 Prepare an audio project for finishing and final mix down.
	33.09 Transfer audio files between various audio software applications.
	33.10 Demonstrate the understanding of audio file bit depth, bandwidth and dithering and be able to explain when and where these apply in various applications of digital audio production.
	33.11 Export finished audio.
34.0	Demonstrate application of MIDI in a game/simulation project. The student will be able to:
	34.01 Demonstrate an understanding of MIDI.
	34.02 Discuss the advantage and use of MIDI in a game/simulation.
	34.03 Discuss the limitations of MIDI.
	34.04 Utilize a computer and multiple MIDI instruments.
	34.05 Record a single sound track; add multiple sound tracks, and change MIDI voices using the software.
	34.06 Export a MIDI soundtrack for use in a game/simulation.
	34.07 Export a MIDI sound effect for use in a game/simulation.
	34.08 Apply MIDI file to an object or game/simulation element.
35.0	Incorporate audio assets into game/simulation engine. The student will be able to:
	35.01 Describe the audio effects workflow.
	35.02 Explain audio codecs and formats used in game/simulation engines.

	35.03 Import audio into the game/simulation engine.
	35.04 Use appropriate naming conventions for audio assets.
	35.05 Describe the use of 3D and surround sound.
	35.06 Apply knowledge of distance/spatial effects including surround sound in a game/simulation.
	35.07 Contrast the audio environment as it relates to the visual environment.
36.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	36.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	36.02 Explain emergency procedures to follow in response to workplace accidents.
	36.03 Create a disaster and/or emergency response plan.
37.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	37.01 Employ leadership skills to accomplish organizational goals and objectives.
	37.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	37.03 Conduct and participate in meetings to accomplish work tasks.
	37.04 Employ mentoring skills to inspire and teach others.
38.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	38.01 Identify and demonstrate positive work behaviors needed to be employable.
	38.02 Develop personal career plan that includes goals, objectives, and strategies.
	38.03 Examine licensing, certification, and industry credentialing requirements.
	38.04 Maintain a career portfolio to document knowledge, skills, and experience.
	38.05 Evaluate and compare employment opportunities that match career goals.
	38.06 Identify and exhibit traits for retaining employment.
	38.07 Identify opportunities and research requirements for career advancement.
	38.08 Research the benefits of ongoing professional development.
	38.09 Examine and describe entrepreneurship opportunities as a career planning option.
39.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
	39.01 Identify and describe the services and legal responsibilities of financial institutions.
	39.02 Describe the effect of money management on personal and career goals.

	39.03 Develop a personal budget and financial goals.
	39.04 Complete financial instruments for making deposits and withdrawals.
	39.05 Maintain financial records.
	39.06 Read and reconcile financial statements.
	39.07 Research, compare and contrast investment opportunities.
Course Number: DIG0074 Occupational Completion Point: C Digital Media Specialist – 150 Hours	
40.0	Understand the history of video effects in the entertainment. The student will be able to:
	40.01 Understand the role of video in a visual presentation.
	40.02 Understand how video effects can establish or reinforce the mood.
	40.03 Understand the importance of production value.
	40.04 Understand the history of video effects production.
	40.05 Understand the technology incorporated into the production video and video effects.
41.0	Understand the various job titles and responsibilities video technician as it relates to game and simulation design. The student will be able to:
	41.01 Identify the job titles of video technicians and artist game project.
	41.02 Demonstrate the ability to work as part of a video production team.
	41.03 Perform the role of the video technical director for a game/simulation project.
	41.04 Perform the role of video editor for a game/simulation project.
	41.05 Perform the role of camera operator for a game/simulation project.
	41.06 Perform the role of special effects coordinator for a game/simulation project.
	41.07 Perform the role of video recording operator for a game/simulation project.
	41.08 Perform the role of video effects artist for a game/simulation project.
	41.09 Perform the role of compositor for a game/simulation project.
42.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
	42.01 Understand the use of “Fair use and Fair Dealing”.
	42.02 Understand the transfer and licensing of creative works.

	42.03 Understand the use of “exclusive rights” to intellectual creations.
	42.04 Demonstrate the use of digital watermarking.
43.0	Demonstrate a knowledge of production writing as it relates to game and simulation design. The student will be able to:
	43.01 Explain the job of a scriptwriter and outline the elements of a script.
	43.02 Demonstrate ability to breakdown a script into video production elements.
	43.03 Demonstrate ability to write simple dialog.
	43.04 Demonstrate ability to translate script elements into production schedule.
	43.05 Demonstrate ability to write narration or instructions for game/simulation.
44.0	Demonstrate appropriate acting skills. The student will be able to:
	44.01 Demonstrate the ability to read aloud in a professional manner.
	44.02 Demonstrate the ability to receive and properly act upon direction given by the producer/director.
	44.03 Understand the concept of acting and playing a role while speaking.
	44.04 Perform the various assignments in a professional manner according to industry standards.
45.0	Demonstrate basic video production. The student will be able to:
	45.01 Use current industry standard production video equipment.
	45.02 Operate camera in studio and location (field) production environments.
	45.03 Demonstrate understanding of digital video storage concepts and digital storage media.
	45.04 Demonstrate knowledge of and the ability to operate digital recording decks, and other digital storage devices.
	45.05 Identify and select microphones for production needs.
	45.06 Determine appropriate lighting needs for production settings.
	45.07 Identify location and studio lighting types, method of use and application.
46.0	Demonstrate set-up and configuration of a computer for video applications. The student will be able to:
	46.01 Install basic peripheral devices related to video programs.
	46.02 Install and configure software related to video programs.
	46.03 Demonstrate basic knowledge of computer system requirements.
	46.04 Demonstrate basic knowledge of installing plug-ins or additional audio source material such as beats and or samples.
	46.05 Understand the signal flow of a digital video workstation.

47.0	Demonstrate the basic operation of a video workstation. The student will be able to:
47.01	Demonstrate knowledge of the digital video workstation interface.
47.02	Demonstrate a working familiarity and understanding of the function and operation of digital video workstations.
47.03	Demonstrate ability to edit, cut, erase, and insert video utilizing various digital production techniques.
47.04	Record video directly to the digital video workstation.
47.05	Demonstrate knowledge of editing video according to message.
47.06	Demonstrate skill in using video effects and plug-ins.
47.07	Prepare a video project for final compositing and export.
47.08	Transfer video files between various video software applications.
47.09	Export finished video.
48.0	Incorporate video assets into game/simulation engine. The student will be able to:
48.01	Demonstrate knowledge of the video effects workflow.
48.02	Demonstrate knowledge of video codecs and formats used in game/simulation engines.
48.03	Demonstrate knowledge and ability to import video into the game/simulation engine.
48.04	Use appropriate naming conventions for video assets.
48.05	Understand the use of placing video assets into a 3D environment.
48.06	Demonstrate knowledge of distance/spatial video effects in relation to sound effects in a game/simulation.
48.07	Understand the audio environment as it relates to the visual environment.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Game/Simulation/Animation Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	B082300	
CIP Number	0550041116	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Game/Simulation Designer, Game Programmer, and Game Software Developer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to practical experiences in game/simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, and implementation issues. Specialized programming skills involving advanced mathematical calculations and physics are also integrated into the curriculum.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	DIG0070	Game/Simulation Designer	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @7 7G DIGI MEDIA 7G COMP PROG 7G	300 hours
B	DIG0075	Game/Simulation Programmer		150 hours
C	DIG0076	Game/Simulation Software Developer		150 hours

Note: OTA0040 is a highly recommended core.

Program Recommendations

This program is project-based and focuses on broad, transferable skills and stresses understanding and demonstration of the following rudiments of the game and simulation industry: production planning, elements of production design, storyboarding, elements of visual design, integration of digital audio and digital video into new game/simulation productions, programming for single and multi-user environments, delivery systems, and collaboration/teamwork.

The Foundations and Design courses should be taken in sequence prior to the Programming and Multi-User Programming courses. The Programming and Multi-User Programming courses may be taken concurrently. It is highly recommended that students complete a programming course prior to taking the last two courses of this program.

This program emphasizes the development of technical abilities as well as ethical and societal awareness necessary to function in a highly technological society. The use of cooperative learning groups is recommended. By learning and practicing group process skills, students will be prepared to work "together" in real work situations. Program graduates will develop enhanced self-esteem as well as the problem solving and teamwork skills necessary to succeed in careers.

The Game/Simulation/Animation Programming program places a strong emphasis on workplace learning. Job shadowing and mentoring experiences with game and simulation professionals along with on-site trips to local businesses connect classroom learning to the workplace. In-class guest speakers bring the real world into the classroom.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify commonly used art and animation production tools in the game design industry.
02.0 Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets.
03.0 Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development.
04.0 Identify tools and software commonly used in game development.
05.0 Investigate career opportunities in the game industry.
06.0 Demonstrate research and information fluency.
07.0 Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
08.0 Explore the methods used to create and sustain player immersion.
09.0 Describe the game development life cycle.
10.0 Demonstrate the professional level of written and oral communication required in the game development industry.
11.0 Understand the core tasks and challenges that face a video game design team.
12.0 Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives.
13.0 Create a working game or simulation as part of a team.
14.0 Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game.
15.0 Categorize the different gaming genres.
16.0 Identify popular games and identify commonality between them.
17.0 Understand the general procedure and requirements of game design.
18.0 Understand the general principles of storytelling for game design.
19.0 Understand character archetypes and character design.
20.0 Develop a game design document.
21.0 Understand the process of creating and designing player choice and other game designer strategy considerations.
22.0 Create and design the game flow as it relates to story and plot.
23.0 Assess common principles and procedures in game flow design.
24.0 Describe player challenge rule creation elements.
25.0 Understand the use of inventory systems in game design.
26.0 Identify functions of information processing.
27.0 Test programs.
28.0 Plan program design.
29.0 Code programs.
30.0 Perform program maintenance.
31.0 Create and maintain documentation.
32.0 Evaluate assigned game programming tasks.
33.0 Implement enhanced program structures.
34.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.

35.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
36.0 Explain the importance of employability skill and entrepreneurship skills.
37.0 Demonstrate personal money-management concepts, procedures, and strategies.
38.0 Identify and describe basic network terminology and network security.
39.0 Game configuration.
40.0 Test programs.
41.0 Plan program design.
42.0 Create and maintain documentation.
43.0 Code programs.
44.0 Demonstrate an understanding of operating systems, environments, and platforms.
45.0 Implement enhanced program structures.
46.0 Implement multimedia programming.
47.0 Develop an understanding of programming techniques and concepts.

Florida Department of Education
Student Performance Standards

Program Title: Game/Simulation/Animation Programming
Career Certificate Program Number: B082300

Course Number: DIG0070 **Occupational Completion Point: A** **Game/Simulation Designer – 300 Hours**	
01.0	Identify commonly used art and animation production tools in the game design industry. The student will be able to:
	01.01 Identify, categorize and discuss art and animation tools commonly used in game design.
02.0	Understand intellectual property rights, copyright laws and plagiarism as it applies to creative assets. The student will be able to:
	02.01 Understand the use of “Fair Use and Fair Dealing”.
	02.02 Understand the transfer and licensing of creative works.
	02.03 Understand the use of “exclusive rights” to intellectual creations.
	02.04 Demonstrate the use of digital watermarking.
03.0	Explain the importance of employability skills and entrepreneurship skills as it relates to game/simulation development. The student will be able to:
	03.01 Identify and demonstrate positive work behaviors needed to be employable.
	03.02 Maintain a career portfolio to document knowledge, skills, and experience.
	03.03 Evaluate and compare employment opportunities that match career goals.
	03.04 Identify and exhibit traits for retaining employment.
04.0	Identify tools and software commonly used in game development. The student will be able to:
	04.01 Identify and discuss the popular game development tools currently used in the industry.
	04.02 Identify and discuss popular gaming engines.
	04.03 Identify and discuss popular world building tools.
05.0	Investigate career opportunities in the game industry. The student will be able to:
	05.01 Describe job requirements for a variety of occupations within the game development industry.
	05.02 Identify current employment trends and career opportunities in the game industry.
06.0	Demonstrate research and information fluency. The student will be able to:
	06.01 Play games to research and collect game play data.

	06.02 Evaluate, analyze and document game styles and playability.
	06.03 Determine the dramatic elements in games, including kinds of fun, player types and nonlinear storytelling.
07.0	Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design. The student will be able to:
	07.01 Test and analyze games to determine the quality of rules, interfaces, navigation, performance, play, artistry and longevity in design and structure.
	07.02 Research and evaluate the game analysis techniques used by the video game industry.
	07.03 Identify the key elements in a game and make intelligent judgments about whether the game succeeded or failed in its objectives.
	07.04 Evaluate professional reviews and write a critical analysis of a current video game.
08.0	Explore the methods used to create and sustain player immersion. The student will be able to:
	08.01 Research and define the term “player immersion”.
	08.02 Explore and explain the factors that create player immersion in a game.
	08.03 Examine popular games and explain the methods each game uses to increase player immersion.
09.0	Describe the game development life cycle. The student will be able to:
	09.01 Identify steps in the pre-production process including the proof of concept and market research.
	09.02 Describe the iterative prototyping process – Alpha, Beta, RTM.
	09.03 Determine platform, technology and scripting requirements.
	09.04 Implement techniques of scenario development, levels, and missions.
	09.05 Discuss game testing requirements and methods.
	09.06 Identify and describe maintenance, upgrade and sequel issues.
10.0	Demonstrate the professional level of written and oral communication required in the game development industry. The student will be able to:
	10.01 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
	10.02 Organize ideas and communicate oral and written messages appropriate for the game development industry environment.
11.0	Understand the core tasks and challenges that face a video game design team. The student will be able to:
	11.01 Identify and define the roles and responsibilities of team members on a video game design team.
	11.02 Explore and discuss methods of communications and scheduling for design teams.
12.0	Demonstrate leadership and teamwork skills needed, as it relates to game/simulation development, to accomplish team goals and objectives. The student will be able to:

	12.01 Employ leadership skills to accomplish organizational goals and objectives.
	12.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	12.03 Conduct and participate in meetings to accomplish work tasks.
	12.04 Employ mentoring skills to inspire and teach others.
13.0	Create a working game or simulation as part of a team. The student will be able to:
	13.01 Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
	13.02 Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
	13.03 Using a simple game development tool, create a game or simulation.
	13.04 Present the game or simulation.
14.0	Create a game design production plan that describes the game play, outcomes, controls, interface and artistic style of a video game. The student will be able to:
	14.01 Use industry standard game design production documents to create a game design production plan.
15.0	Categorize the different gaming genres. The student will be able to:
	15.01 Research, compare and categorize the different gaming genres.
	15.02 Analyze examples of different gaming genres.
	15.03 Define and use the necessary vocabulary related to gaming and the different genres.
16.0	Identify popular games and identify commonality between them. The student will be able to:
	16.01 Analyze and deconstruct game environments and interactions.
	16.02 Compare and contrast the top selling video games in terms of player interaction, plot complexity, and reward.
	16.03 Categorize gameplay elements by player type (killer, talker, explorer and achiever).
17.0	Understand the general procedure and requirements of game design. The student will be able to:
	17.01 Describe the design process from conception to production.
	17.02 Explain the iterative nature of game design through the different stages of design iterations including pre-alpha, alpha, beta, release candidate, going gold and support.
	17.03 Develop design plans, for example, character sketches, documentation and storyboards for proposed games.
18.0	Understand the general principles of storytelling for game design. The student will be able to:
	18.01 Identify the essential elements of a story.
	18.02 Describe how creative writing is used as a game design tool.

	18.03 Compare and contrast methods of delivering a story in a game.
19.0	Understand character archetypes and character design. The student will be able to:
	19.01 Research and identify common character archetypes used in computer games.
	19.02 Design character prototypes to physically match archetype.
	19.03 Create character backstory and profile.
20.0	Develop a game design document. The student will be able to:
	20.01 Create a game strategy overview, character overview, and storyboard overview.
	20.02 Define the rules of play and multi-player options.
	20.03 Define strategic positioning of game immersion dynamics and psychological effect.
	20.04 Describe how game layout charts are used in game design.
	20.05 Understand the use of storyboards in the game design industry with regard to environmental illustrations, level designs, character designs, model sheets and GUI Designs.
21.0	Understand the process of creating and designing player choice and other game designer strategy considerations. The student will be able to:
	21.01 Describe the use of artificial intelligence challenges in game design and the need for giving the player rest time between challenges.
	21.02 Evaluate the impact of randomness in game design especially as it pertains to pattern recognition.
	21.03 Identify techniques used in the industry to help the player to navigate.
	21.04 Discuss the principles of player-centric design.
	21.05 Examine and discuss design elements that encourage continuous active engagement both mental and physical.
	21.06 Analyze design elements that maintain player interest and vary the degree of challenge.
	21.07 Discuss the need for a balance of design elements for the purpose of rewarding and frustrating players.
22.0	Create and design the game flow as it relates to story and plot. The student will be able to:
	22.01 Identify techniques of introducing the story plot and beginning play.
	22.02 Describe story plot development techniques for the middle of play in game design.
	22.03 Analyze and discuss planning techniques for climax and finale of games.
23.0	Assess common principles and procedures in game flow design. The student will be able to:
	23.01 Assess missions and scenarios game flow techniques.
	23.02 Describe common use of mission design and campaigns.
	23.03 Evaluate usage of static versus dynamic campaigns.

24.0	Describe player challenge rule creation elements. The student will be able to:
	24.01 Research common design methods for clearing obstacles or series of obstacles.
	24.02 Describe common design elements introducing skill, luck and combinations including escalating challenges to games.
	24.03 Identify common design elements used to vary weapons, characters and tools.
	24.04 Discuss the incorporation of risk reward and adaptive challenges (AI).
25.0	Understand the use of inventory systems in game design. The student will be able to:
	25.01 Discuss the various methods of describing items in player's inventory in contemporary game design.
	25.02 Review and discuss industry methods of communicating how inventory items can have an effect on game play.
Course Number: DIG0075 Occupational Completion Point: B Game/Simulation Programmer – 150 Hours	
26.0	Identify functions of information processing. The student will be able to:
	26.01 Identify characteristics of high-level languages.
	26.02 Identify characteristics of operating systems.
	26.03 Identify characteristics of a network.
	26.04 Identify needs for software development in the game/simulation industry.
	26.05 Identify causes of software development problems in the game/simulation industry.
	26.06 Identify most appropriate languages for solving game/simulation industry problems.
	26.07 Manipulate data between numbering systems.
	26.08 Identify how numeric and non-numeric data are represented in memory.
	26.09 Distinguish among integer, fixed-point, and floating-point calculations.
27.0	Test programs. The student will be able to:
	27.01 Develop a plan for testing programs.
	27.02 Develop test harnesses for use in program testing.
	27.03 Perform debugging activities.
	27.04 Distinguish among the different types of program and design errors.
	27.05 Evaluate program test results.

	27.06 Execute programs and subroutines as they relate to the total application.
	27.07 Use trace routines of compilers to assist in program debugging.
	27.08 Compile and run programs.
	27.09 Create a stable code base.
28.0	Plan program design. The student will be able to:
	28.01 Formulate a plan to determine program specifications individually or in groups.
	28.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
	28.03 Design programs to solve problems using problem-solving strategies.
	28.04 Prepare proper input/output layout specifications.
	28.05 Examine existing utility programs and subroutines for use with other programs.
	28.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
29.0	Code programs. The student will be able to:
	29.01 Utilize reference manuals.
	29.02 Write programs according to recognized programming standards.
	29.03 Write internal documentation statements as needed in the program source code.
	29.04 Code programs in high-level languages for game/simulation applications.
	29.05 Write code that accesses sequential, random, and direct files.
	29.06 Code programs using logical statements (e.g., If-Then-Else, Do...While).
	29.07 Enter and modify source code using a program language editor.
	29.08 Code routines within programs that validate input data.
	29.09 Use the rounding function in calculations within programs.
	29.10 Write programs as part of a development team.
	29.11 Write event-driven programs.
	29.12 Write programs using timed-event strategies and methodologies.
	29.13 Write programs that include score keeping.
30.0	Perform program maintenance. The student will be able to:
	30.01 Review requested modification of programs and establish a plan of action.

	30.02 Design needed modifications in conformance with established standards.
	30.03 Code, test, and debug modifications prior to updating production code.
	30.04 Update production programs and documentation with changes.
	30.05 Analyze output to identify and annotate errors or enhancements.
31.0	Create and maintain documentation. The student will be able to:
	31.01 Write documentation to assist operators and end-users.
	31.02 Follow established documentation standards.
	31.03 Update existing documentation to reflect program changes.
32.0	Evaluate assigned game programming tasks. The student will be able to:
	32.01 Estimate the time necessary to write a program.
33.0	Implement enhanced program structures. The student will be able to:
	33.01 Write programs that include tables or arrays and routines for data entry and lookup.
	33.02 Write programs to import/export data from external sources.
	33.03 Write programs that use iteration.
	33.04 Write routines that incorporate “help” text.
	33.05 Write programs that read and write random files.
	33.06 Write interactive programs.
	33.07 Design screen layouts for use in interactive programs.
	33.08 Write programs using object-oriented languages.
	33.09 Write programs that include data structures (e.g., stacks, queues, trees, linked lists).
	33.10 Write programs that are event-driven to support player goals and actions.
34.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	34.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	34.02 Explain emergency procedures to follow in response to workplace accidents.
	34.03 Create a disaster and/or emergency response plan.
35.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	35.01 Employ leadership skills to accomplish organizational goals and objectives.

	35.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	35.03 Conduct and participate in meetings to accomplish work tasks.
	35.04 Employ mentoring skills to inspire and teach others.
36.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	36.01 Identify and demonstrate positive work behaviors needed to be employable.
	36.02 Develop personal career plan that includes goals, objectives, and strategies.
	36.03 Examine licensing, certification, and industry credentialing requirements.
	36.04 Maintain a career portfolio to document knowledge, skills, and experience.
	36.05 Evaluate and compare employment opportunities that match career goals.
	36.06 Identify and exhibit traits for retaining employment.
	36.07 Identify opportunities and research requirements for career advancement.
	36.08 Research the benefits of ongoing professional development.
	36.09 Examine and describe entrepreneurship opportunities as a career planning option.
37.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
	37.01 Identify and describe the services and legal responsibilities of financial institutions.
	37.02 Describe the effect of money management on personal and career goals.
	37.03 Develop a personal budget and financial goals.
	37.04 Complete financial instruments for making deposits and withdrawals.
	37.05 Maintain financial records.
	37.06 Read and reconcile financial statements.
	37.07 Research, compare and contrast investment opportunities.
Course Number: DIG0076 **Occupational Completion Point: C** **Game/Simulation Software Developer – 150 Hours**	
38.0	Identify and describe basic network terminology and network security. The student will be able to:
	38.01 Define networking and describe the purpose of a network.
	38.02 Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards).

	38.03 Describe the various types of network topologies.
	38.04 Describe the various types of game protocols.
	38.05 Demonstrate knowledge of general security concepts.
	38.06 Develop an awareness of communication security concepts.
	38.07 Develop an awareness of network infrastructure security.
	38.08 Describe the various types of multiplayer game architectures.
	38.09 Identify networking and server design requirements for multi-player games.
	38.10 List and describe performance metrics for networked games.
39.0	Game configuration. The student will be able to:
	39.01 Create a window to run a game.
	39.02 Describe and use appropriate game libraries to run a windowed game.
	39.03 Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available.
	39.04 Troubleshoot problems with computer hardware based on different graphic modes of the game.
	39.05 Describe ethical issues and problems associated with computer games.
	39.06 Read and comprehend technical and non-technical reading assignments related to course content including trade journals, books, magazines and electronic sources.
	39.07 Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.
	39.08 Explore, design, implement, and evaluate organizational structures and cultures for managing project teams.
	39.09 Identify characteristics of operating systems and graphics pipeline.
	39.10 Distinguish among integer and floating-point bounding box collision calculations.
	39.11 Illustrate various configurations of software libraries.
40.0	Test programs. The student will be able to:
	40.01 Develop data for use in program testing.
	40.02 Perform debugging activities.
	40.03 Distinguish among the different types of program and design errors.
	40.04 Evaluate program test results.
	40.05 Execute programs and subroutines as they relate to the total application.
	40.06 Use trace routines of compilers to assist in program debugging.

	40.07 Compile and run programs.
41.0	Plan program design. The student will be able to:
	41.01 Formulate a plan to determine program specifications individually or in groups.
	41.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
	41.03 Design programs to solve problems using problem-solving strategies.
	41.04 Prepare proper input/output layout specifications.
	41.05 Examine existing utility programs and subroutines for use with other programs.
	41.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
42.0	Create and maintain documentation. The student will be able to:
	42.01 Write documentation to assist operators and end-users.
	42.02 Follow established documentation standards.
	42.03 Update existing documentation to reflect program changes.
43.0	Code programs. The student will be able to:
	43.01 Utilize reference manuals.
	43.02 Write programs according to recognized programming standards.
	43.03 Write internal documentation statements as needed in the program source code.
	43.04 Code programs in high-level languages for gaming and simulation applications.
	43.05 Write code that accesses sequential, indexed sequential, random, and direct files.
	43.06 Code programs using logical statements (e.g., if-then-else, do...while).
	43.07 Enter and modify source code using a program language editor.
	43.08 Code routines within programs that validate input data.
	43.09 Use the rounding function in calculations within programs.
	43.10 Write programs that display text.
	43.11 Demonstrate proficiency in drawing lines using graphic primitive functions.
	43.12 Demonstrate proficiency in drawing rectangles using graphic primitive functions.
	43.13 Demonstrate proficiency in drawing circles using graphic primitive functions.
	43.14 Demonstrate proficiency in drawing ellipses using graphic primitive functions.

	43.15 Demonstrate proficiency in drawing polygons using graphic primitive functions.
	43.16 Write programs that use composite graphic objects.
	43.17 Write programs that load a bitmap for background.
	43.18 Write programs that use a sprite handler.
	43.19 Write programs that use animation.
	43.20 Write programs that use scrolling.
	43.21 Write programs that use transparency.
44.0	Demonstrate an understanding of operating systems, environments, and platforms. The student will be able to:
	44.01 Identify various types of operating systems/environments for different computer hardware platforms.
	44.02 Assess and analyze the functions of different operating systems.
	44.03 Distinguish between different types of computer hardware platforms.
45.0	Implement enhanced program structures. The student will be able to:
	45.01 Write programs that include tables or arrays and routines for data entry and lookup.
	45.02 Write routines to sort arrays.
	45.03 Write programs that sort records in files.
	45.04 Write programs to process transactions.
	45.05 Write programs that use iteration.
	45.06 Write programs that read and write sequential files.
	45.07 Write programs that read and write random files.
46.0	Implement multimedia programming. The student will be able to:
	46.01 Demonstrate proficiency in creating multiple composite objects.
	46.02 Demonstrate proficiency in moving composite graphics objects.
	46.03 Demonstrate proficiency in rotating composite graphics objects by hand.
	46.04 Distinguish between flock and flee artificial intelligence algorithms.
	46.05 Write programs that use blitting.
	46.06 Simulate circular game board.
	46.07 Demonstrate proficiency in creating a firing simulation.

	46.08 Identify the basic constructs used in bounding box collision algorithm.
	46.09 Identify the basic constructs used in truer bounding box collision.
	46.10 Demonstrate proficiency in creating a creating a bouncing simulation.
	46.11 Simulate pattern-based movement.
	46.12 Simulate multiple sprites movement.
	46.13 Identify the basic constructs used in keyboard input.
	46.14 Identify the basic constructs used in mouse input.
	46.15 Identify the basic constructs used in double buffering.
47.0	Develop an understanding of programming techniques and concepts. The student will be able to:
	47.01 Identify the basic constructs used in structured programming.
	47.02 Distinguish between top-down and bottom-up design.
	47.03 Distinguish between iteration and recursion.
	47.04 Evaluate Boolean expressions.
	47.05 Distinguish between interpreters and compilers.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Technology Support Services**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y100100	
CIP Number	0515120200	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in computer technology support positions in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills.

The content includes but is not limited to practical experiences in the implementation, management, and maintenance of advanced technology user environments.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of one occupational completion point in the program.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0059	Technology Support Specialist	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G	600 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of computer systems.
02.0 Demonstrate knowledge of different operating systems.
03.0 Develop a familiarity with the information technology industry.
04.0 Develop an awareness of microprocessors and digital computers.
05.0 Develop an awareness of the different types of printers.
06.0 Develop an awareness of emerging technologies.
07.0 Demonstrate an understanding of the Open Systems Interface (OSI) model.
08.0 Identify computer components and their functions.
09.0 Demonstrate proficiency using the Internet to locate information.
10.0 Demonstrate proficiency using Hypertext Markup Language (HTML).
11.0 Demonstrate proficiency in webpage design.
12.0 Demonstrate proficiency using common software applications.
13.0 Perform email activities.
14.0 Demonstrate proficiency in using presentation software and equipment.
15.0 Perform decision-making activities in a multimedia environment.
16.0 Demonstrate proficiency with personal computer hardware.
17.0 Troubleshoot printers.
18.0 Demonstrate proficiency with installing and configuring client system hardware.
19.0 Demonstrate proficiency in troubleshooting, repair and maintenance of client systems.
20.0 Demonstrate proficiency with client operating systems and software.
21.0 Configure and perform system backup and recovery of a client system.
22.0 Configure a Virtual Hard Disk (VHD) on a client system.
23.0 Demonstrate proficiency with networking.
24.0 Demonstrate an understanding of fundamental computer security.
25.0 Demonstrate proficiency with installing, configuring, and upgrading common client software applications or suites.
26.0 Solve software installation escalations.
27.0 Solve software failure escalations.
28.0 Demonstrate proficiency with technical support operational procedures.
29.0 Describe the operation of data networks.
30.0 Differentiate between various network media and topologies.
31.0 Install and configure basic network devices.
32.0 Demonstrate proficiency using basic network tools.
33.0 Demonstrate an understanding of network IP addressing and associated issues.
34.0 Demonstrate an understanding of network management tasks and methodologies.
35.0 Implement a Wireless Local Area Network (WLAN).
36.0 Demonstrate an understanding of network security threats and mitigation techniques.

37.0 Demonstrate proficiency with troubleshooting network operating systems.
38.0 Configure Full Disk Encryption (FDE) software.
39.0 Identify basic cloud concepts.
40.0 Configure intranet tunneling software.
41.0 Demonstrate proficiency with cloud-based technologies.
42.0 Demonstrate proficiency in configuring and maintaining remote connections.
43.0 Perform installation, configuration, and management operations for both client and server disks.
44.0 Monitor system performance.
45.0 Optimize system performance.
46.0 Demonstrate proficiency with troubleshooting specialized network and communications devices.
47.0 Configure and maintain network-based technologies associated with providing web services.

Florida Department of Education
Student Performance Standards

Program Title: Technology Support Services
Career Certificate Program Number: Y100100

Course Number: CTS0059 **Occupational Completion Point: A** **Technology Support Specialist – 600 Hours**	
01.0	Demonstrate knowledge, skill, and application of computer systems. The student will be able to:
01.01	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
01.02	Describe the types of communications and networking systems used in workplace environments.
01.03	Locate and use software application reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals.
01.04	Troubleshoot problems with computer hardware peripherals.
01.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
01.06	Demonstrate proficiency in using the basic features of GUI browsers.
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Identify the most common computer operating systems.
02.02	Describe and use industry accepted file naming conventions, particularly in NTFS and FAT file systems.
02.03	Demonstrate proficiency with file management tasks.
02.04	Demonstrate a working knowledge of standard file formats.
02.05	Compare and contrast various operating systems.
02.06	Differentiate between different operating systems and applications.
02.07	Compare and contrast open source and proprietary software.
02.08	Explain how system utilities are used to maintain computer performance.
03.0	Develop a familiarity with the information technology industry. The student will be able to:
03.01	Explain how information technology impacts the operation and management of business and society.
03.02	Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile).
03.03	Describe how digital technologies (social media) are changing both work and personal lifestyles.
04.0	Develop an awareness of microprocessors and digital computers. The student will be able to:

	04.01 Describe the evolution of the digital computer.
	04.02 Explain the general architecture of a microcomputer system.
	04.03 Explain the evolution of microprocessors.
	04.04 Explain software hierarchy and its impact on microprocessors.
	04.05 Explain the need for and use of peripherals.
	04.06 Demonstrate proficiency installing and using plug-and-play peripherals.
	04.07 Identify the basic concepts of computer maintenance and upgrades.
05.0	Develop an awareness of the different types of printers. The student will be able to:
	05.01 Describe the different types.
	05.02 Explain how drivers work with printers.
	05.03 Demonstrate troubleshooting techniques to repair printers.
06.0	Develop an awareness of emerging technologies. The student will be able to:
	06.01 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer).
	06.02 Describe social media as an emerging technology.
	06.03 Adhere to published best practices for protecting personal identifiable information when using the Internet.
	06.04 Identify trends related to the use of information technology in people's personal and professional lives.
	06.05 Characterize how the rapid pace of change in information technology impacts our society.
07.0	Demonstrate an understanding of the Open Systems Interface (OSI) model. The student will be able to:
	07.01 Describe the evolution of OSI from its inception to the present and into the future.
	07.02 Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.
	07.03 Describe the purpose of the OSI model and each of its layers.
	07.04 Explain specific functions belonging to each OSI model layer.
	07.05 Understand how two network nodes communicate through the OSI model.
	07.06 Discuss the structure and purpose of data packets and frames.
	07.07 Describe the two types of addressing covered by the OSI model.
08.0	Identify computer components and their functions. The student will be able to:
	08.01 Identify the internal components of a computer.

	08.02 Use common computer and DOS commands terminology.
09.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
	09.01 Identify and describe web terminology.
	09.02 Define Universal Resource Locators (URLs) and associated protocols.
	09.03 Compare and contrast the types of Internet domains.
	09.04 Describe and observe Internet/Intranet ethics and copyright laws and regulatory control.
	09.05 Trace the evolution of the Internet from its inception to the present and into the future.
	09.06 Demonstrate proficiency using search engines, including Boolean search strategies.
	09.07 Demonstrate proficiency using various web tools.
	09.08 Compare and contrast the roles of web servers and web browsers.
10.0	Demonstrate proficiency using Hypertext Markup Language (HTML). The student will be able to:
	10.01 Categorize websites according to their purpose.
	10.02 Describe the types of documents that might be used in a web environment.
	10.03 Identify elements of a webpage.
	10.04 Define basic HTML terminology.
	10.05 Critique the aesthetic and functional operation of sample websites.
	10.06 Create storyboards depicting a multi-page website.
	10.07 Design, edit, and test HTML documents for accuracy and validity.
	10.08 Create and modify webpages using a Graphical User Interface (GUI) editor.
	10.09 Enhance webpages through the addition of images and graphics including animation.
	10.10 Analyze webpage source code developed by others.
	10.11 Create webpages using basic HTML tags.
11.0	Demonstrate proficiency in webpage design. The student will be able to:
	11.01 Develop an awareness of acceptable webpage design, including index pages in relation to the rest of the website.
	11.02 Describe and apply color theory as it applies to webpage design.
	11.03 Access and digitize graphics through various resources.
	11.04 Use image design software to create and edit images.

	11.05 Demonstrate proficiency in publishing to the Internet.
	11.06 Explain the need for web-based applications.
12.0	Demonstrate proficiency using common software applications. The student will be able to:
	12.01 Compare and contrast the appropriate use of various software applications.
	12.02 Demonstrate proficiency in the use of various software applications.
13.0	Perform email activities. The student will be able to:
	13.01 Describe email capabilities and functions.
	13.02 Identify components of an email message.
	13.03 Identify the components of an email address.
	13.04 Identify when to use different email options.
	13.05 Attach a file to an email message.
	13.06 Forward an email message.
	13.07 Use an address book.
	13.08 Create a private email group.
	13.09 Reply to an email message.
	13.10 Use the Internet to perform email activities.
	13.11 Identify the appropriate use of email and demonstrate related email etiquette.
	13.12 Identify when to include information from an original email message in a response.
	13.13 Identify common problems associated with widespread use of email.
14.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
	14.01 Produce a presentation that includes music, animation, and digital photography and present it using a projection system.
	14.02 Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
	14.03 Demonstrate knowledge of the roles and responsibilities of a multimedia production team.
	14.04 Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
	14.05 Create a self-running presentation with synchronized audio, convert presentation slides into streaming ASF files for use on the web.
15.0	Perform decision-making activities in a multimedia environment. The student will be able to:
	15.01 Determine work priorities, the audience, project budgets, project specifications, and the production schedule.

	15.02 Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks.
	15.03 Present and defend design projects.
	15.04 Evaluate criteria for selecting an operating system.
16.0	Demonstrate proficiency with personal computer hardware. The student will be able to:
	16.01 Categorize storage devices and backup media.
	16.02 Explain motherboard components, types and features.
	16.03 Classify power supplies types and characteristics.
	16.04 Explain the purpose and characteristics of CPUs and their features.
	16.05 Explain cooling methods and devices.
	16.06 Compare and contrast memory types, characteristics and their purpose.
	16.07 Distinguish between the different display devices and their characteristics.
	16.08 Summarize the function and types of adapter cards.
17.0	Troubleshoot printers. The student will be able to:
	17.01 Demonstrate proficiency with device drivers.
	17.02 Troubleshoot common hardware errors.
18.0	Demonstrate proficiency with installing and configuring client system hardware. The student will be able to:
	18.01 Install, configure and optimize personal computer components.
	18.02 Install, configure, and optimize laptop components.
	18.03 Install, configure, and optimize client system peripherals.
	18.04 Demonstrate proficiency using the following tools:
	• Multimeter.
	• Power supply tester.
	• Cable testers.
	• Loop back plugs.
	• Anti-static pad and wrist strap.
	• Extension magnet.
19.0	Demonstrate proficiency in troubleshooting, repairing and maintaining of client systems. The student will be able to:

	19.01 Explain the troubleshooting theory.
	19.02 Explain and interpret common hardware and operating system symptoms and their causes.
	19.03 Determine the troubleshooting methods and tools for printers.
	19.04 Explain and interpret common mobile device issues and determine the appropriate basic troubleshooting method.
	19.05 Integrate common preventative maintenance techniques.
	19.06 Analyze system/application logs and other system resources to identify and/or resolve performance issues related to display, disk space, and virtual memory.
	19.07 Use appropriate client system tools and utilities to diagnose and resolve hardware failure issues, including hard drive sectors, memory, cabling, and BIOS.
20.0	Demonstrate proficiency with client operating systems and software. The student will be able to:
	20.01 Compare and contrast the different client operating systems and their features.
	20.02 Explain the process and steps to install and configure a client operating system.
	20.03 Explain the basics of boot sequences, methods and startup utilities.
	20.04 Perform a clean installation of an operating system.
	20.05 Perform a version upgrade to an existing operating system, maintaining user profiles, preferences, and historical information.
21.0	Configure and perform a system backup and recovery of a client system. The student will be able to:
	21.01 Compare and contrast system backup and system imaging.
	21.02 Create a system image file or backup file as appropriate.
	21.03 Create system restore points.
	21.04 Configure system images and backup files for automatic update.
	21.05 Recover a system using either a system image file or backup file.
22.0	Configure a Virtual Hard Disk (VHD) on a client system. The student will be able to:
	22.01 Create, deploy, boot, mount, and update a VHD.
	22.02 Perform offline updates.
	22.03 Perform offline servicing.
23.0	Demonstrate proficiency with networking. The student will be able to:
	23.01 Summarize the basics of networking fundamentals, including technologies, devices and protocols.
	23.02 Categorize network cables by function, speed, and connectors.
	23.03 Compare and contrast the different network types.

	23.04 Validate client configuration for network connectivity.
	23.05 Install and configure connectivity for a small local area network using either IPv4 or IPv6.
	23.06 Set up user accounts for a small local area network.
	23.07 Configure file and folder access using NTFS permissions and sharing.
24.0	Demonstrate an understanding of fundamental computer security. The student will be able to:
	24.01 Explain basic security concepts and technologies, including firewalls, encryption technologies, and authentication.
	24.02 Describe the following security and authentication features and technologies:
	• Advantages and disadvantages of specific wireless security types; keys; SSID; MAC filters.
	• Malicious software protection.
	• BIOS Security.
	• Password complexity.
	• Locking workstation.
	• Biometrics and physical authentication.
	24.03 Discuss the basics of data sensitivity and security, including compliance, classifications, and social engineering.
	24.04 Install, configure, and launch antivirus software, isolating or removing viruses and malware as needed.
	24.05 Configure a local security policy and associated authentication and authorization rules.
25.0	Demonstrate proficiency with installing, configuring, and upgrading common client software applications or suites. The student will be able to:
	25.01 Validate software licensing compliance and system compatibility.
	25.02 Perform initial installation of a common software application.
	25.03 Perform an upgrade of a common software application.
	25.04 Set default Internet browser.
	25.05 Install software and/or browser add-ins.
26.0	Solve software installation escalations. The student will be able to:
	26.01 Verify installation permissions.
	26.02 Validate local administrator requirement.
	26.03 Determine licensing restrictions.
	26.04 Validate digital signing.

27.0	Solve software failure escalations. The student will be able to:
	27.01 Check the appropriate OS troubleshooting utilities.
	27.02 Check whether the application runs in Safe mode.
	27.03 Isolate the problem and repair the installation.
	27.04 Check recently added programs.
	27.05 Restore or reimage the system.
28.0	Demonstrate proficiency with technical support operational procedures. The student will be able to:
	28.01 Adhere to safety and environmental procedures related to ESD, SMI, RFI, electrical safety, cabling, and physical/environmental.
	28.02 Describe the characteristics desired in establishing and maintaining good customer relations.
	28.03 Demonstrate appropriate communication skills and professionalism in customer interactions.
	28.04 Apply call center vocabulary.
29.0	Describe the operation of data networks. The student will be able to:
	29.01 Explain the function of common networking protocols.
	29.02 Identify commonly used TCP and UDP default ports.
	29.03 Identify IP address formats.
	29.04 Identify the proper use of IP addressing technologies and addressing schemes.
	29.05 Identify common IPv4 and IPv6 routing protocols.
	29.06 Explain the purpose and properties of routing.
	29.07 Compare the characteristics of wireless communication standards.
	29.08 Interpret network diagrams.
30.0	Differentiate between various network media and topologies. The student will be able to:
	30.01 Categorize standard cable types and their properties.
	30.02 Identify common connector types.
	30.03 Identify common physical network topologies.
	30.04 Differentiate and implement appropriate wiring standards.
	30.05 Select the appropriate media, cables, ports, and connectors to connect network devices.
	30.06 Categorize WAN technology types and properties.

	30.07 Categorize LAN technology types and properties.
	30.08 Explain common logical network topologies and their characteristics.
	30.09 Install components of wiring distribution.
31.0	Install and configure basic network devices. The student will be able to:
	31.01 Install, configure and differentiate between common network devices.
	31.02 Identify the functions of specialized network devices.
	31.03 Explain the advanced features of a switch.
	31.04 Implement a small switched network, including remote access management.
	31.05 Verify network status and operation using basic utilities (e.g., ping, traceroute, telnet, SSH, arp, ipconfig).
	31.06 Implement a basic wireless network.
32.0	Demonstrate proficiency using basic network tools. The student will be able to:
	32.01 Select the appropriate command line interface tool and interpret the output to verify functionality.
	32.02 Explain the purpose of network scanners.
	32.03 Utilize the appropriate hardware tools.
33.0	Demonstrate an understanding of network IP addressing and associated issues. The student will be able to:
	33.01 Assign and verify valid IP addresses in a LAN environment.
	33.02 Describe Network Address Translation (NAT) and its role in network communication.
	33.03 Distinguish between public and private IP addresses.
	33.04 Explain the operation of DHCP and DNS services and their impact on network client systems.
	33.05 Detect and correct IP addressing issues.
34.0	Demonstrate an understanding of network management tasks and methodologies. The student will be able to:
	34.01 Explain the function of each layer of the OSI model.
	34.02 Identify types of configuration management documentation.
	34.03 Evaluate the network based on configuration management documentation.
	34.04 Explain network segmentation and traffic management concepts.
	34.05 Conduct network monitoring to identify performance and connectivity issues.
	34.06 Explain different methods and rationales for network performance optimization.

	34.07 Configure updates to a network operating system to include manual, automatic, and rollback aspects.
	34.08 Implement network troubleshooting methodologies.
	34.09 Troubleshoot common connectivity issues and select an appropriate solution.
35.0	Implement a Wireless Local Area Network (WLAN). The student will be able to:
	35.01 Describe the standards associated with wireless media.
	35.02 Identify and describe the purpose of the components of a small WLAN.
	35.03 Configure a small WLAN such that devices connect to the correct access point.
	35.04 Describe the security features and capabilities of WI-FI Protected Access (WPA).
	35.05 Describe common issues with implementing a WLAN and methods for addressing these issues.
36.0	Demonstrate an understanding of network security threats and mitigation techniques. The student will be able to:
	36.01 Explain the function of hardware and software security devices.
	36.02 Explain common features of a firewall.
	36.03 Explain the methods of network access security.
	36.04 Explain methods of user authentication.
	36.05 Explain issues that affect device security.
	36.06 Implement password and physical security in a small routed network.
	36.07 Identify common security threats and mitigation techniques.
37.0	Demonstrate proficiency with troubleshooting server based operating systems. The student will be able to:
	37.01 Select the appropriate commands and options to troubleshoot and resolve problems.
	37.02 Select and use system utilities/tools appropriate to a problem and evaluate the results.
	37.03 Evaluate and resolve common issues.
38.0	Configure Full Disk Encryption (FDE) software (e.g., BitLocker, BitLocker To Go). The student will be able to:
	38.01 Describe disk encryption and its role and benefits in computer system security.
	38.02 Compare and contrast disk encryption with file system encryption.
	38.03 Configure system policies to accommodate full disk encryption.
	38.04 Explain the role of the Trusted Platform Module (TPM) relative to computer system identification and security.
	38.05 Manage TPM startup keys.

	38.06 Configure startup key storage.
	38.07 Describe a Data Recovery Agent (DRA) and its role in system security.
	38.08 Configure a DRA on a client and network server.
	38.09 Perform data and system recovery operations.
39.0	Identify basic cloud concepts. The student will be able to:
	39.01 Understand the distinction between SaaS, IaaS and PaaS.
	39.02 Distinguish between cloud deployment models.
	39.03 Understand cloud computing characteristics.
40.0	Configure intranet tunneling software. The student will be able to:
	40.01 Describe Internet Protocol Security (IPSec) and its role in secure tunnel connectivity.
	40.02 Compare and contrast the characteristics and operation of an infrastructure tunnel and an intranet tunnel.
	40.03 Configure endpoints required for an intranet tunnel connection.
	40.04 Configure system and user authentication for an intranet tunnel connection.
	40.05 Define the requirements for establishing a network infrastructure tunnel.
	40.06 Resolve tunnel connectivity issues.
41.0	Demonstrate proficiency with cloud-based technologies. The student will be able to:
	41.01 Describe cloud-based technologies and their unique challenges.
	41.02 Map network drives.
	41.03 Configure offline file policies for synchronized access to network shared files.
	41.04 Describe transparent caching and explain its role in optimizing network performance, particularly mobile networks.
	41.05 Describe Power over Ethernet (PoE) and its role in creating a power management schema.
42.0	Demonstrate proficiency in configuring and maintaining remote connections. The student will be able to:
	42.01 Establish a Virtual Private Network (VPN) connection with authentication.
	42.02 Enabling a VPN reconnect to accommodate mobile remote users.
	42.03 Perform a Strength, Weakness, Opportunity, and Threat (SWOT) analysis of a local area network configured for remote access connectivity.
	42.04 Describe Network Access Protection (NAP) and its role in ensuring health and compliance of connected devices.
	42.05 Compare and contrast the use of quarantine and captive portals to accomplish remediation of connected devices.

	42.06 Configure NAP for wireless remote connections.
	42.07 Configure dial-up connections.
	42.08 Enable and configure remote desktop in both client and server environments.
43.0	Perform installation, configuration, and management operations for both client and server disks. The student will be able to:
	43.01 Install, initialize, and partition a hard drive.
	43.02 Describe file system fragmentation and its impact on system performance.
	43.03 Perform a file system defragmentation.
	43.04 Describe Redundant Array of Independent Disks (RAID) configuration.
	43.05 Configure removable device policies.
44.0	Monitor system performance. The student will be able to:
	44.01 Configuring event logging.
	44.02 Filtering event logs.
	44.03 Event subscriptions.
	44.04 Data collector sets.
	44.05 Generating a system diagnostics report.
45.0	Optimize system performance. The student will be able to:
	45.01 Update device drivers.
	45.02 Configure a Network Interface Card (NIC) for full duplex operation.
	45.03 Create a power plan (scheme) for optimum power/energy efficiency.
	45.04 Configure performance settings under Advanced System Properties.
	45.05 Configure desktop settings and user profiles.
	45.06 Configure services and programs to resolve performance issues.
	45.07 Resolve mobile computing performance issues.
46.0	Demonstrate proficiency with troubleshooting specialized network and communications devices. The student will be able to:
	46.01 Select the appropriate commands and options to troubleshoot and resolve problems with network devices.
	46.02 Select and use system utilities/tools appropriate to a problem and evaluate the results.
	46.03 Evaluate and resolve common issues related to network connectivity, security, and performance of connected devices.

47.0	Configure and maintain network-based technologies associated with providing web services. The student will be able to:
	47.01 Configure and maintain a web server, to include setting up authentication, security certificates, and permissions for Active Server Page operation.
	47.02 Connect to a File Transfer Protocol (FTP) server, to include setting up access and permissions.
	47.03 Connect to mail transfer protocol server.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computations (Mathematics) and Communication (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

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Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Computer Systems & Information Technology (CSIT)**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y100200	
CIP Number	0511090107	
Grade Level	30, 31	
Program Length	900 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	FBLA-PBL, BPA, SkillsUSA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading Language Arts): 9

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of occupations in the information technology industry.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the information technology industry; technical and product skills, underlying principles of technology, planning, management, finance, labor issues, community issues and health, safety, and environmental issues.

The content includes but is not limited to communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points. When the recommended sequence is followed, the structure is intended to prepare students to complete the CompTIA A+, Network+, and Security+ industry certifications. Sufficient coverage of advanced networking concepts and competencies may also lead to Cisco's CCST and CCNA industry certifications. A student who completes the applicable competencies at any occupational completion point may either continue with the training or become an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0082	Computer Systems Technician	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G INFO TECH 7 G CYBER TECH 7 G ELECTRONIC @7 7 G	300 hours
B	CTS0083	Computer Network Technician		150 hours
C	CTS0084	Computer Networking Specialist		150 hours
D	CTS0069	Computer Security Technician		300 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate proficiency with personal computer hardware.
02.0 Apply troubleshooting, repairing and maintenance techniques.
03.0 Understand operating systems and software.
04.0 Identify and construct a basic network.
05.0 Analyze and react to various security threats and vulnerabilities.
06.0 Explain the basic physical security elements of a network.
07.0 Demonstrate proficiency with operational procedure.
08.0 Demonstrate language arts knowledge and skills.
09.0 Demonstrate mathematics knowledge and skills.
10.0 Demonstrate proficiency with installing, configuring, and troubleshooting personal computer hardware.
11.0 Apply techniques to various operating systems.
12.0 Build, secure and troubleshoot medium to large networks.
13.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
14.0 Solve problems using critical thinking skills, creating and innovation.
15.0 Use information technology tools.
16.0 Describe the roles within teams, work units, departments, organizations, interorganizational systems, and the larger environment.
17.0 Describe the importance of professional ethics and legal responsibilities.
18.0 Describe the operation of data networks.
19.0 Verify connectivity between two end devices.
20.0 Configure a Layer 3 switch.
21.0 Program a router with basic configurations
22.0 Explain how IPv6 address assignments are implemented in a business network.
23.0 Explain how data is moved across the network, from opening an application, to receiving data.
24.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
25.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
26.0 Explain the importance of employability skill and entrepreneurship skills.
27.0 Describe a switched network a small-to-medium-sized business.
28.0 Describe a routing environment.
29.0 Explore the concept of switches and security.
30.0 Configure and troubleshoot a Layer 3 environment.
31.0 Configure, troubleshoot and implement ACLs.
32.0 Demonstrate knowledge of how network services and protocols interact to provide network communication in order to securely implement and use common protocols.
33.0 Demonstrate an understanding of cybersecurity concepts and research.
34.0 Recognize attacks and apply appropriate solutions.

35.0 Recognize and be able to differentiate and explain the following access control models.
36.0 Comprehend and develop an understanding of protocol security and associated risks.
37.0 Recognize and understand remote access technologies.
38.0 Identify and administer security fixes as defined by the appropriate OSI layers.
39.0 Recognize and understand the administration of the following directory security concepts.
40.0 Identify wireless technologies, concepts and vulnerabilities.
41.0 Apply advanced principles of security techniques.
42.0 Define concepts of Key Management and Certificate Lifecycles.
43.0 Understand the application of the following concepts of physical security.
44.0 Understand security concerns for types of network topologies and media.
45.0 Implement the process of network system hardening within a computer network.
46.0 Describe the security implications of the following topics of disaster recovery options.
47.0 Demonstrate proficiency in applying the concepts and uses of the following types of policies and procedures.
48.0 Understand different types of privilege management.
49.0 Understand the concepts of cybersecurity guidelines.
50.0 Understand training of end users, executives and human resources in security vulnerabilities.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Systems & Information Technology**
Career Certificate Program Number: **Y100200**

Course Number: CTS0082 **Occupational Completion Point: A** **Computer Systems Technician – 300 Hours**	
01.0	Demonstrate proficiency with personal computer hardware. The student will be able to:
01.01	Categorize storage devices and backup media.
01.02	Explain motherboard components, types and features.
01.03	Classify power supplies types and characteristics.
01.04	Explain the purpose and characteristics of CPUs and their features.
01.05	Explain cooling methods and devices.
01.06	Compare and contrast memory types, characteristics and their purpose.
01.07	Distinguish between the different display devices and their characteristics.
01.08	Install and configure peripherals and input devices.
01.09	Summarize the function and types of adapter cards.
01.10	Install, configure and optimize laptop components and features.
01.11	Install and configure printers.
01.12	Explain advantages of using PCIe adapter cards.
01.13	Configure tablets and mobile phones.
01.14	Configure network printers using a static IP address.
02.0	Apply troubleshooting, repairing and maintenance techniques. The student will be able to:
02.01	Explain the troubleshooting theory.
02.02	Explain and interpret common hardware and operating system symptoms and their causes.
02.03	Explain and interpret common operating system symptoms and their causes.
02.04	Determine the troubleshooting methods and tools for printers.
02.05	Explain and interpret common laptop issues and determine the appropriate basic troubleshooting method.

	02.06 Integrate common preventative maintenance techniques.
	02.07 Explain and interpret common software symptoms and their causes.
03.0	Understand operating systems and software. The student will be able to:
	03.01 Compare and contrast the different Windows Operating Systems from Windows 10 up and their features.
	03.02 Explain the difference in features of the various Windows versions from Windows 10 through Windows 11.
	03.03 Explain the process and steps to install and configure the Windows OS.
	03.04 Explain the basics of boot sequences, methods and startup utilities, including msconfig and Task Manager's Startup tab.
04.0	Identify and construct a basic network. The student will be able to:
	04.01 Summarize the basics of networking fundamentals, including technologies and devices.
	04.02 Summarize the basics of networking fundamentals, including technologies and protocols.
	04.03 Categorize network cables and connectors and their implementations.
	04.04 Compare and contrast the different network types include SOHO networks.
05.0	Analyze and react to various security threats and vulnerabilities. The student will be able to:
	05.01 Explain the basic principles of security concepts and technologies (physical, software, social engineering).
	05.02 Explain and define security features.
06.0	Explain the basic physical security elements of a network. The student will be able to:
	06.01 Explain the basic software security elements of a network, including firewalls, IDS and IPS.
	06.02 Explain how the human element plays a major role in network security, including social engineering.
07.0	Demonstrate proficiency with operational procedure. The student will be able to:
	07.01 Outline the purpose of appropriate safety and environmental procedures and given a scenario apply them.
	07.02 Given a problem, demonstrate communication and technical skills to escalate the problem for a solution.
	07.03 Explain chain of custody procedures for handling IT assets, storage devices, and equipment in various scenarios.
08.0	Demonstrate language arts knowledge and skills. The student will be able to:
	08.01 Locate, comprehend and evaluate key elements of oral and written information.
	08.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
	08.03 Present information formally and informally for specific purposes and audiences.
09.0	Demonstrate mathematics knowledge and skills. The student will be able to:

	09.01 Demonstrate knowledge of arithmetic operations.
	09.02 Analyze and apply data and measurements to solve problems and interpret documents.
	09.03 Construct charts/tables/graphs using functions and data.
10.0	Demonstrate proficiency with installing, configuring, and troubleshooting personal computer hardware. The student will be able to:
	10.01 Install, configure and maintain personal computer components.
	10.02 Detect problems, troubleshoot and repair/replace personal computer components.
	10.03 Install, configure, detect problems, troubleshoot and repair/replace laptop components.
	10.04 Explain and demonstrate the use of computer tools.
11.0	Apply techniques to various operating systems. The student will be able to:
	11.01 Select the appropriate commands and options to troubleshoot and resolve problems.
	11.02 Differentiate between Operating System file structures.
	11.03 Given a scenario, select and use system utilities/tools and evaluate the results.
	11.04 Evaluate and resolve common issues.
12.0	Build, secure and troubleshoot medium to large networks. The student will be able to:
	12.01 Troubleshoot client-side connectivity issues using appropriate tools.
	12.02 Install and configure a small office home office (SOHO) network.
	12.03 Given a scenario, prevent, troubleshoot and remove viruses and malware.
	12.04 Implement security and troubleshoot common issues.
13.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	13.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	13.02 Locate, organize and reference written information from various sources.
	13.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	13.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	13.05 Apply active listening skills to obtain and clarify information.
	13.06 Develop and interpret tables and charts to support written and oral communications.
	13.07 Exhibit public relations skills that aid in achieving customer satisfaction.
14.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:

	14.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	14.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	14.03 Identify and document workplace performance goals and monitor progress toward those goals.
	14.04 Conduct technical research to gather information necessary for decision-making.
15.0	Use information technology tools. The student will be able to:
	15.01 Use personal information management (PIM) applications to increase workplace efficiency.
	15.02 Employ technological tools to expedite workflow, including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	15.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	15.04 Employ collaborative/groupware applications to facilitate group work.
16.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	16.01 Describe the nature and types of business organizations.
	16.02 Explain the effect of key organizational systems on performance and quality.
	16.03 List and describe quality control systems and/or practices common to the workplace.
	16.04 Explain the impact of the global economy on business organizations.
17.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	17.01 Evaluate and justify decisions based on ethical reasoning.
	17.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	17.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	17.04 Interpret and explain written organizational policies and procedures.
	17.05 Explain various types of software licensing, including open-source, proprietary, subscription-based, and cloud licensing models.
Course Number: CTS0083 Occupational Completion Point: B Computer Network Technician – 150 Hours	
18.0	Describe the operation of data networks. The student will be able to:
	18.01 Explain how multiple networks are used in everyday life.
	18.02 Explain the topologies and devices used in a small-to-medium-sized business network.
	18.03 Explain the basic characteristics of a network that supports communication in a small-to-medium-sized business.

18.04	Explain trends in networking that will affect the use of networks in small-to-medium-sized businesses.
18.05	Explain the purpose of the IOS.
18.06	Explain how to access and navigate the IOS to configure network devices.
18.07	Describe the command structure of the IOS software.
18.08	Configure hostnames on an IOS device using the CLI.
18.09	Use IOS commands to limit access to device configurations.
18.10	Use IOS commands to save the running configuration.
18.11	Explain how devices communicate across network media.
18.12	Configure a host device with an IP address.
19.0	Verify connectivity between two end devices. The student will be able to:
19.01	Explain how rules are used to facilitate communication.
19.02	Explain the role of protocols and standards organizations in facilitating interoperability in network communications.
19.03	Explain how devices on a LAN access resources in a small to medium-sized business network.
19.04	Identify device connectivity options.
19.05	Describe the purpose and functions of the physical layer in the network.
19.06	Describe basic principles of the physical layer standards.
19.07	Identify the basic characteristics of network cables and connector types.
19.08	Build and terminate UTP cable used in Ethernet networks.
19.09	Describe, build and terminate fiber-optic cabling and its main advantages over other media.
19.10	Describe wireless media, including Wi-Fi standards (802.11), cellular networks (4G/5G), and satellite communication technologies.
19.11	Select the appropriate network transmission media for a given requirement and connect devices.
19.12	Describe the operation of the Ethernet sub layers.
19.13	Identify the major fields of the Ethernet frame.
19.14	Describe the purpose and characteristics of the Ethernet MAC address.
19.15	Describe the purpose of ARP.
19.16	Explain how ARP requests impact network and host performance.
19.17	Explain basic switching concepts.

	19.18 Compare fixed configuration and modular switches.
20.0	Configure a Layer 3 switch. The student will be able to:
	20.01 Explain how network layer protocols and services support communications across data networks.
	20.02 Explain how routers enable end-to-end connectivity in a small to medium-sized business network.
	20.03 Determine the appropriate device to route traffic in a small to medium-sized business network.
21.0	Program a router with basic configurations. The student will be able to:
	21.01 Describe the purpose of the transport layer in managing the transportation of data in end-to-end communication.
	21.02 Describe characteristics of the TCP and UDP protocols, including port numbers and their uses.
	21.03 Explain how TCP session establishment and termination processes facilitate reliable communication.
	21.04 Explain how TCP protocol data units are transmitted and acknowledged to guarantee delivery.
	21.05 Explain the UDP client processes to establish communication with a server.
	21.06 Determine whether high-reliability TCP transmissions, or non-guaranteed UDP transmissions, are best suited for common applications.
	21.07 Describe the structure of an IPv4 address.
	21.08 Describe the purpose of the subnet mask.
	21.09 Compare the characteristics and uses of the unicast, broadcast, and multicast IPv4 addresses.
	21.10 Compare the use of public address space and private address space.
	21.11 Explain the need for IPv6 addressing.
	21.12 Describe the representation of an IPv6 address.
	21.13 Describe types of IPv6 network addresses.
	21.14 Configure global unicast addresses.
	21.15 Describe multicast addresses.
	21.16 Describe the role of ICMP in an IP network. (Include IPv4 and IPv6).
	21.17 Use ping and trace route utilities to test network connectivity.
	21.18 Explain why routing is necessary for hosts on different networks to communicate.
	21.19 Describe IP as a communication protocol used to identify a single device on a network.
	21.20 Given a network and a subnet mask, calculate the number of host addresses available.
	21.21 Calculate the necessary subnet mask in order to accommodate the requirements of a network.

	21.22 Describe the benefits of variable length subnet masking (VLSM).
22.0	Explain how IPv6 address assignments are implemented in a business network. The student will be able to:
	22.01 Explain how the functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications.
	22.02 Describe how common application layer protocols interact with end user applications.
	22.03 Describe, at a high level, common application layer protocols that provide Internet services to end-users, including WWW services and email.
	22.04 Describe application layer protocols that provide IP addressing services.
	22.05 Describe the features and operation of well-known application layer protocols that allow for file sharing services.
23.0	Explain how data is moved across the network, from opening an application, to receiving data. The student will be able to:
	23.01 Identify the devices and protocols used in a small network.
	23.02 Explain how a small network serves as the basis of larger networks.
	23.03 Describe the need for basic security measures on network devices.
	23.04 Identify security vulnerabilities and general mitigation techniques.
	23.05 Configure network devices with device hardening features to mitigate security threats.
	23.06 Use the output of ping and trace commands to establish relative network performance.
24.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	24.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	24.02 Explain emergency procedures to follow in response to workplace accidents.
	24.03 Create a disaster and/or emergency response plan.
25.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	25.01 Employ leadership skills to accomplish organizational goals and objectives.
	25.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	25.03 Conduct and participate in meetings to accomplish work tasks.
	25.04 Employ mentoring skills to inspire and teach others.
26.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
	26.01 Identify and demonstrate positive work behaviors needed to be employable.
	26.02 Develop personal career plan that includes goals, objectives, and strategies.

	26.03 Examine licensing, certification, and industry credentialing requirements.
	26.04 Maintain a career portfolio to document knowledge, skills, and experience.
	26.05 Evaluate and compare employment opportunities that match career goals.
	26.06 Identify and exhibit traits for retaining employment.
	26.07 Identify opportunities and research requirements for career advancement.
	26.08 Research the benefits of ongoing professional development.
	26.09 Examine and describe entrepreneurship opportunities as a career planning option.

Course Number: CTS0084 **Occupational Completion Point: C** **Computer Networking Specialist – 150 Hours**	
27.0	Describe a switched network a small-to-medium-sized business. The student will be able to:
	27.01 Describe convergence of data, voice, and video in the context of switched networks.
	27.02 Setup and configure a switched environment.
	27.03 Troubleshoot and diagnose a switched environment.
28.0	Describe a routing environment. The student will be able to:
	28.01 Configure a router to route between multiple directly connected networks.
	28.02 Describe the primary functions and features of a router.
	28.03 Explain how routers use information in data packets to make forwarding decisions in a small-to medium-sized business network.
	28.04 Describe configure and troubleshoot VLAN routing environment.
29.0	Explore the concept of switches and security. The student will be able to:
	29.01 Explain the advantages and disadvantages of static routing.
	29.02 Configure switch ports and security.
	29.03 Describe security best practices in a switch environment.
	29.04 Explain, configure and troubleshoot VLAN in a switch network.
30.0	Configure and troubleshoot a Layer 3 environment. The student will be able to:
	30.01 Explain the advantages and disadvantages of Layer 3 ~~of static~~ routing.
	30.02 Define, compare and configure the different categories of routing protocols

31.0	Configure, troubleshoot and implement ACLs. The student will be able to:
	31.01 Explain, configure and modify ACL's
	31.02 Apply ACLs to filter traffic.
32.0	Demonstrate knowledge of how network services and protocols interact to provide network communication in order to securely implement and use common protocols. The student will be able to:
	32.01 Describe and configure protocols (i.e., SMTP, TCP-IP, MAC, DNS, FTP and DHCP).
	32.02 Identify commonly used default network ports.
	32.03 Troubleshoot configure protocols within a switched network.
Course Number: CTS0069 Occupational Completion Point: D Computer Security Technician – 300 Hours	
33.0	Demonstrate an understanding of cybersecurity concepts and research. The student will be able to:
	33.01 Describe the history of cybersecurity, including the evolution of a hacker culture.
	33.02 Discuss the trends and national initiatives related to cybersecurity.
	33.03 Distinguish between information assurance and cybersecurity.
	33.04 Describe the concepts of confidentiality as it relates to user and data impact.
	33.05 Explain authentication and the concept of non-repudiation.
34.0	Recognize attacks and apply appropriate solutions. The student will be able to:
	34.01 Recognize and define network susceptibilities and attacks. (i.e., DOS/DDOS (Denial of Service/Distributed Denial of Service)).
	34.02 Recognize and define Password Guessing (e.g., Brute Force, Dictionary).
	34.03 Recognize and define Software Exploitation.
	34.04 Define email vulnerabilities apply appropriate security measures.
35.0	Recognize and be able to differentiate and explain the following access control models. The student will be able to:
	35.01 Recognize and define MAC (Mandatory Access Control).
	35.02 Recognize and define DAC (Discretionary Access Control).
	35.03 Recognize and define RBAC (Role Based Access Control).
36.0	Comprehend and develop an understanding of protocol security and associated risks. The student will be able to:
	36.01 Identify non-essential services and protocols running on hosts and network devices and know what actions to take to reduce the risks

	of those services and protocols.
36.02	Understand the concept of and know how reduce the risks of social engineering.
36.03	Understand the concept and significance of auditing, logging and system scanning.
36.04	Identify and be able to differentiate different cryptographic standards and protocols.
37.0	Recognize and understand remote access technologies. The student will be able to:
37.01	Recognize and define 802.1x.
37.02	Recognize and define RADIUS (Remote Authentication Dial-In User Service).
37.03	Recognize and define TACACS (Terminal Access Controller Access Control System) and TACTCs+.
37.04	Recognize and define L2TP/PPTP (Layer Two Tunneling Protocol/Point to Point Tunneling Protocol).
37.05	Recognize and define SSH (Secure Shell).
37.06	Recognize and define IPSEC (Internet Protocol Security).
38.0	Identify and administer security fixes as defined by the appropriate OSI layers. The student will be able to:
38.01	Recognize and define TLS (Transport Layer Security) and explain why SSL is no longer secure.
38.02	Recognize and define LDAP (Lightweight Directory Access Protocol).
39.0	Recognize and understand the administration of the following directory security concepts. The student will be able to:
39.01	Identify the different types of application layer protocol (POP3, SMTP, DNS and FTP).
39.02	Recognize and define File Sharing.
39.03	Recognize and define Vulnerabilities (i.e., packet sniffing, naming conventions).
40.0	Identify-wireless technologies, concepts and vulnerabilities. The student will be able to:
40.01	Recognize and define modern wireless encryption and security methods (e.g., WPA3, EAP, 802.1X) used to protect wireless networks.
40.02	Differentiate Wi-Fi threats.
40.03	Apply encryption protocols for wireless networks.
41.0	Apply advanced principles of security techniques. The student will be able to:
41.01	Compare and contrast Host-based, network-based, and endpoint detection/response (EDR) techniques.
41.02	Be able to identify and explain cryptographic algorithms
41.03	Understand how cryptography and digital signatures address the following security concepts.
41.04	Identify authentication tools (e.g. PKI Public Key Infrastructure, Certificates, Revocation and Trust Models).

42.0	Define concepts of Key Management and Certificate Lifecycles. The student will be able to:
	42.01 Identify various security CA requirements.
	42.02 Understand Hardware versus software key storage, Private key storage, Escrow, Expiration, Revocation, Renewal, Destruction, Key Usage, Multiple Key Pairs.
	42.03 Create key management and procedures.
43.0	Understand the application of the following concepts of physical security. The student will be able to:
	43.01 Define Access Control (e.g., physical barriers, biometrics).
	43.02 Define Social Engineering.
	43.03 Defines issues related to Environment (e.g., wireless cells, location, shielding, fire suppression).
44.0	Understand security concerns for types of network topologies and media. The student will be able to:
	44.01 Recognize, define, and configure network hardware, appliances and handheld devices.
	44.02 Define, and configure Network Monitoring/Diagnostics tools.
	44.03 Understand the security concerns for the following types of media.
45.0	Implement the process of network system hardening within a computer network. The student will be able to:
	45.01 Install and configure Updates (Firmware & Software).
	45.02 Install and configure Operating System and ACL's.
	45.03 Enable and Disable Services and Protocols.
	45.04 Setup and configure a server hardening within a computer network.
46.0	Describe the security implications of the following topics of disaster recovery options and utilities. The student will be able to:
	46.01 Define and use Backups Secure Recovery, Recovery Plan and Alternative sites. (On-site versus off-site storage).
	46.02 Recognize and define Backup Utilities and High Availability/Fault Tolerance.
47.0	Demonstrate proficiency in applying the concepts and uses of the following types of policies and procedures. The student will be able to:
	47.01 Demonstrate proficiency and understanding of Security Policy Acceptable Use, Privacy, Separation of Duties, Need to Know, Password Management and SLA's.
	47.02 Demonstrate proficiency and understanding of Disposal/Destruction.
	47.03 Demonstrate proficiency and understanding of HR policies related to passwords, privileges, and Code of Ethics in hiring and termination situations.
	47.04 Demonstrate proficiency and understanding of Incident Response Policy.
48.0	Understand different types of privilege management. The student will be able to:

	48.01 Identify User/Group/Role Management and Single Sign-on.
	48.02 Define Centralized vs. Decentralized.
	48.03 Understand the importance of Auditing (Privilege, Usage, Escalation).
	48.04 Define MAC/DAC/RBAC (Mandatory Access Control/Discretionary Access Control/Role Based Access Control).
49.0	Understand the concepts of cybersecurity guidelines. The student will be able to:
	49.01 Demonstrate an understanding of the concepts of forensics guidelines.
	49.02 Explain Systems Architecture and documentation.
	49.03 Explain Change Logs and Inventories.
	49.04 Explain Classification/Notification, Schema, Retention/Storage, and Destruction.
	49.05 Understand and be able to explain the following concepts of risk identification.
	49.06 Explain Asset Identification and Risk Assessment.
	49.07 Define threat identification and vulnerabilities.
50.0	Understand training of end users, executives and human resources in security vulnerabilities. The student will be able to:
	50.01 Identify effective training strategies and education resources.
	50.02 Create appropriate methods of security Information awareness strategies.
	50.03 Understand importance of On-line Resources.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

No new students may be enrolled in this program starting 2026-2027. The last year to report any enrollment is 2027-2028. This program was replaced by Applied Cybersecurity Y100500 (0511100316).

Program Title: **Applied Cybersecurity**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y100300	
CIP Number	0511100302	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics) 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and cybersecurity-related careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of cybersecurity.

The content includes but is not limited to foundational knowledge and skills in computer and network security, security vulnerabilities, attack mechanisms and techniques, intrusion detection and prevention, cryptographic systems, system hardening, risk identification, incidence response, penetration testing, key management, access control, and recovery. Specialized courses focus on database security, planning and analysis, software, and web security.

Additional Information relevant to this Career and Technology (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points (OCPs). To complete this program, students must complete OCP A plus one of the subsequent courses in OCP B.

This program is comprised of courses that have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0018	Cybersecurity Associate	BUS ED 1 @2 COMPU SCI 6 CYBER TECH 7G INFO TECH 7G	600 hours
B	CTS0019	Information Security Manager **OR**		150 hours
	CTS0021	Data Security Specialist **OR**		150 hours
	CTS0060	Software Security Specialist **OR**		150 hours
	CTS0085	Web Security Specialist **OR**		150 hours
	CTS0089	Information Security Administrator		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
	01.01 Use reading skills.
	01.02 Use writing skills.
	01.03 Use mathematical strategies and procedures.
	01.04 Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
	02.01 Use critical thinking.
	02.02 Use creativity.
	02.03 Make sound decisions.
	02.04 Solve problems.
	02.05 Reason.
	02.06 Plan and organize.
03.0	Manage resources within an industry project
	03.01 Manage time.
	03.02 Manage money or resources.
	03.03 Manage materials.
	03.04 Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
	04.01 Manage systems.
	04.02 Monitor systems.
	04.03 Improve systems.
05.0	Use information for decision making.
	05.01 Locate information.
	05.02 Organize information.
	05.03 Use information.
	05.04 Analyze information.

	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of computer systems.
02.0 Demonstrate knowledge of different operating systems.
03.0 Develop a familiarity with the information technology industry.
04.0 Develop an awareness of microprocessors and digital computers.
05.0 Develop an awareness of programming languages.
06.0 Develop an awareness of emerging technologies.
07.0 Demonstrate an understanding of the Open Systems Interconnection (OSI) models.
08.0 Demonstrate an understanding of the TCP/IP model.
09.0 Identify computer components and their functions.
10.0 Demonstrate proficiency using the Internet to locate information.
11.0 Demonstrate an understanding of Internet safety and ethics.
12.0 Demonstrate proficiency using common software applications.
13.0 Perform email activities.
14.0 Demonstrate proficiency in using presentation software and equipment.
15.0 Perform decision-making activities in a multimedia environment.
16.0 Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications.
17.0 Describe the national agencies and supporting initiatives involved in cybersecurity.
18.0 Discuss the underlying concepts of terms used in cybersecurity.
19.0 Demonstrate an understanding of basic computer components, their functions, and their operation.
20.0 Demonstrate knowledge of different operating systems.
21.0 Demonstrate an understanding of the Open Systems Interconnection (OSI) model. The student will be able to
22.0 Demonstrate an understanding of the TCP/IP model.
23.0 Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model.
24.0 Demonstrate proficiency using computer networks.
25.0 Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections.
26.0 Demonstrate an understanding of basic security concepts.
27.0 Demonstrate an understanding of legal and ethical issues in cybersecurity.
28.0 Demonstrate an understanding of virtualization technology.
29.0 Recognize and understand the administration of the following types of remote access technologies.
30.0 Understand the application of the following concepts of physical security.
31.0 Securely configure and maintain the following types of devices.
32.0 Understand the societal and security challenges of emerging technologies.
33.0 Recognize and be able to differentiate and explain the following access control models.
34.0 Understand the security concerns for the following types of media.
35.0 Explain the following security topologies as they relate to cybersecurity.
36.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.

37.0 Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges.
38.0 Demonstrate an understanding of common information and computer system security vulnerabilities.
39.0 Demonstrate an understanding of common cyber attack mechanisms, their consequences, and motivation for their use.
40.0 Be able to identify and explain the following different kinds of cryptographic algorithms.
41.0 Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity.
42.0 Understand how cryptography and digital signatures address the following security concepts.
43.0 Understand and be able to explain the following concepts of PKI (Public Key Infrastructure).
44.0 Demonstrate an understanding of certificates and their role in cybersecurity.
45.0 Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation.
46.0 Demonstrate an understanding of Intrusion Detection Systems (IDS).
47.0 Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
48.0 Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
49.0 Demonstrate an understanding of IDS applications.
50.0 Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques.
51.0 Demonstrate an understanding of firewalls and other means of intrusion prevention.
52.0 Demonstrate an understanding of vulnerabilities unique to virtual computing environments.
53.0 Demonstrate an understanding of social engineering and its implications to cybersecurity.
54.0 Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability.
55.0 Demonstrate an understanding of how to configure host systems to guard against cyber intrusion.
56.0 Demonstrate an understanding of authentication methods and strategies.
57.0 Demonstrate an understanding of methods and strategies for controlling access to computer networks.
58.0 Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured.
59.0 Demonstrate an understanding of the processes involved in hardening a computer system or network.
60.0 Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations.
61.0 Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization.
62.0 Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes.
63.0 Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase.
64.0 Demonstrate proficiency in cybersecurity risk mitigation planning.
65.0 Demonstrate proficiency in establishing a risk management framework.
66.0 Demonstrate proficiency in creating a corporate security policy.
67.0 Demonstrate proficiency in addressing process risks.
68.0 Demonstrate proficiency in addressing physical security risks.
69.0 Demonstrate proficiency in cybersecurity contingency planning.
70.0 Demonstrate proficiency in cybersecurity disaster recovery planning.
71.0 Demonstrate proficiency in cybersecurity business continuity planning.
72.0 Demonstrate proficiency in the essential elements of forensic analysis.
73.0 Demonstrate an understanding of database design, structure, and operation.
74.0 Demonstrate a fundamental understanding of Structured Query Language (SQL).
75.0 Demonstrate an understanding of database security policies.
76.0 Demonstrate an understanding of database access control, functions, methods, and verification.

77.0 Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures.
78.0 Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery.
79.0 Demonstrate an understanding of software design, structure, and operation.
80.0 Demonstrate a fundamental understanding of common software attack vectors.
81.0 Demonstrate an understanding input syntax validation.
82.0 Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code.
83.0 Demonstrate an understanding of the role of environment variables in the operation of software applications.
84.0 Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks.
85.0 Demonstrate an understanding of the primary security services used in Internet and intranet environments.
86.0 Demonstrate a fundamental understanding of the SSL protocol stack and its elements.
87.0 Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms.
88.0 Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates.
89.0 Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network.
90.0 Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains.
91.0 Complete a safety skills inventory.
92.0 Demonstrate acceptable project values.
93.0 Demonstrate the ability to detect and resolve system vulnerabilities.
94.0 Plan, organize, and carry out a penetration-testing plan.
95.0 Demonstrate proficiency in conducting forensic analysis.
96.0 Successfully work as a member of a team.
97.0 Manage time according to a plan.
98.0 Keep acceptable records of progress problems and solutions.
99.0 Manage resources.
100.0 Use tools, materials, and processes in an appropriate and safe manner.
101.0 Research content related to the project and document the results.
102.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
103.0 Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon.

Florida Department of Education
Student Performance Standards

Program Title: **Applied Cybersecurity**
Career Certificate Program Number: **Y100300**

Course Number: CTS0018 **Occupational Completion Point: A** **Cybersecurity Associate – 600 Hours**	
01.0	Demonstrate knowledge, skill, and application of computer systems. The student will be able to:
01.01	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
01.02	Describe the types of communications and networking systems used in workplace environments.
01.03	Locate and use software application reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals.
01.04	Troubleshoot problems with computer hardware peripherals.
01.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
01.06	Demonstrate proficiency in using the basic features of GUI browsers.
01.07	Configure computer systems to protect against various low-level attacks.
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Identify the most common computer operating systems.
02.02	Describe and use industry accepted file naming conventions, particularly in NTFS, ext4, FAT, and ReFS file systems.
02.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
02.04	Demonstrate a working knowledge of standard file formats.
02.05	Compare and contrast various operating systems (e.g., Android iOS, Windows, Mac, Linux).
02.06	Differentiate between different operating systems and applications.
02.07	Compare and contrast open source and proprietary software.
02.08	Explain how system utilities are used to maintain computer performance.
02.09	Evaluate criteria for selecting an operating system.
02.10	Configure various operating systems from their default settings to low, medium, and high security level settings.
03.0	Develop a familiarity with the information technology industry. The student will be able to:
03.01	Explain how information technology impacts the operation and management of business and society.

	03.02 Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile).
	03.03 Describe how digital technologies (social media) are changing both work and personal lifestyles.
	03.04 Demonstrate an understanding of configuring social media used for business to meet various business requirements.
	03.05 Demonstrate an awareness of Cloud based infrastructure including SaaS (Software as a Service) and their impact on the IT industry.
04.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
	04.01 Explain software hierarchy and its impact on microprocessors as it relates to the limitation and/or increase in security.
	04.02 Explain the need for and use of peripherals and how they can compromise security.
	04.03 Demonstrate proficiency installing and using plug-and-play peripherals and explain their associated security risks.
	04.04 Identify the basic concepts of computer maintenance and upgrades and their relevance as it relates to security.
05.0	Develop an awareness of programming languages. The student will be able to:
	05.01 Explain the need for and use of compilers.
	05.02 Identify the three types of programming design approaches (e.g., top-down, structured, object-oriented).
	05.03 Compare the various types or classes of programming languages (e.g., compiled, interpretive).
	05.04 Differentiate among source code, machine code, interpreters, and compilers.
	05.05 Characterize the major categories of programming languages and how they are used.
	05.06 Create a model flowchart for a computer program using software applications like RAPTOR or MS VISIO.
	05.07 Describe the stages in the software development life cycle and explain how to successfully implement them.
	05.08 Compare security and vulnerabilities of various programming languages.
06.0	Develop an awareness of emerging technologies. The student will be able to:
	06.01 Compare and contrast emerging technologies and describe how they impact the security of business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, vehicles, home networks, peer-to-peer, IoT, embedded systems, AI).
	06.02 Adhere to published best practices for protecting personal identifiable information when using the Internet.
	06.03 Identify trends related to the secure use of information technology in people's personal and professional lives.
	06.04 Characterize how the rapid pace of change in information technology impacts our society's ability to keep the appropriate level of security.
07.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) models. The student will be able to:
	07.01 Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.

	07.02 Describe the purpose of the OSI model and each of its layers.
	07.03 Explain specific functions belonging to each OSI model layer.
	07.04 Understand how two network nodes communicate through the OSI model.
	07.05 Discuss the structure and purpose of data packets and frames.
	07.06 Describe the two types of addressing covered by the OSI model.
08.0	Demonstrate an understanding of the TCP/IP model. The student will be able to:
	08.01 Explain the interrelations of the four layers of the TCP/IP model as it relates to hardware and software.
	08.02 Describe the purpose of the TCP/IP model and each of its layers.
	08.03 Explain specific functions belonging to each TCP/IP model layer.
	08.04 Understand how two network nodes communicate through the TCP/IP model.
	08.05 Describe the two types of addressing covered by the TCP/IP model.
09.0	Identify computer components and their functions. The student will be able to:
	09.01 Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	09.02 Use common computer and programming terminology.
10.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:
	10.01 Identify and describe web terminology.
	10.02 Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto) and their associated secure protocols (e.g. https, ftps, ssh).
	10.03 Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	10.04 Demonstrate proficiency using search engines, including Boolean search strategies.
	10.05 Demonstrate proficiency using various secure web tools (e.g., downloading of files, transfer of files, SSH, PDF).
	10.06 Compare and contrast the roles of web servers and web browsers.
	10.07 Compare and contrast MS Web Servers and Linux Web Servers.
11.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:
	11.01 Describe cyber-bullying and its impact on perpetrators and victims.
	11.02 Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.
	11.03 Describe risks associated with sexting, including related legal issues, social engineering aspects, prevention methods, and reporting of offenses.

	11.04 Describe the risks associated with online gaming and ways to reduce these risks.
	11.05 Describe the intellectual property rights, ethics and legalities of downloading music or videos from the Internet.
	11.06 Describe various risks associated with social networking sites and ways to reduce these risks.
	11.07 Describe the risks associated with various conferencing programs and ways to reduce these risks.
	11.08 Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.
12.0	Demonstrate proficiency using common software applications. The student will be able to:
	12.01 Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, email, presentation, database, scheduling, financial management, Java applet, music).
	12.02 Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, email, presentation, database, scheduling, financial management, Java applet, music).
13.0	Perform email activities. The student will be able to:
	13.01 Describe email capabilities and functions.
	13.02 Identify components of an email message.
	13.03 Identify the components of an email address.
	13.04 Identify when to use different email options.
	13.05 Attach a file to an email message.
	13.06 Forward an email message.
	13.07 Use an address book if an address book is available via the school's Outlook server for the student to use.
	13.08 Reply to an email message.
	13.09 Use the Internet to perform email activities.
	13.10 Identify the appropriate use of email and demonstrate related email etiquette.
	13.11 Recognize a fraudulent email and deal with it appropriately.
	13.12 Identify common problems associated with widespread use of email.
	13.13 Create folders to organize email.
14.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
	14.01 Produce a presentation that includes music, animation, and digital photography and present it using appropriate technology.
	14.02 Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
	14.03 Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g. project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers).

	14.04 Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
	14.05 Create a self-running presentation with synchronized audio, convert presentation slides (e.g., PowerPoint) into streaming ASF files for use on the web.
15.0	Perform decision-making activities in a multimedia environment. The student will be able to:
	15.01 Determine work priorities, the audience, project budgets, project specifications and the production schedule.
	15.02 Evaluate and select appropriate software packages and multimedia tools to complete assigned tasks.
	15.03 Present and defend design projects.
16.0	Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications. The student will be able to:
	16.01 Define cybersecurity.
	16.02 Describe how information security evolved into cybersecurity and the impact of the Internet on the pace and nature of the evolution.
	16.03 Describe the individual elements that comprise the CIA triad (i.e., Confidentiality, Integrity, Availability).
	16.04 Define and explain the various types of hackers and the role each plays in cybersecurity.
	16.05 Describe various methodologies used by hackers and the basis for their employment.
	16.06 Describe the individual elements of the AAA model (Authentication, Authorization and Accounting).
17.0	Describe the national agencies and supporting initiatives involved in cybersecurity. The student will be able to:
	17.01 Describe the role of the National Security Agency.
	17.02 Describe current trends in cyber-attacks and strategies for combating them.
	17.03 Describe the legal implications of computer hacking and other forms of cyber-attacks.
	17.04 Understand the importance of the weekly bulletins distributed by the United States Computer Emergency Readiness Team (US-CERT).
	17.05 Determine if any software or hardware on a given network has vulnerabilities outlined in the most recent US-CERT bulletin.
18.0	Discuss the underlying concepts of terms used in cybersecurity. The student will be able to:
	18.01 Differentiate between cybersecurity and information assurance.
	18.02 Define confidentiality and give examples of security breaches.
	18.03 Define integrity and give examples of security breaches.
	18.04 Define authenticity and give examples of security breaches.
	18.05 Define accountability (non-repudiation) and give examples of security breaches.
19.0	Demonstrate an understanding of basic computer components, their functions, and their operation. The student will be able to:

	19.01	Describe the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	19.02	Demonstrate and understanding of common computer and programming terminology.
	19.03	Explain the physical and logical architecture of a microcomputer system.
	19.04	Describe the file types used in the operation of a computer.
	19.05	Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management).
20.0	Demonstrate knowledge of different operating systems. The student will be able to:	
	20.01	Compare operating system file naming conventions.
	20.02	Describe the common elements that comprise the architecture of an operating system (e.g., kernel, file manager, memory manager, device manager, network manager).
	20.03	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	20.04	Demonstrate a working knowledge of standard file formats.
	20.05	Describe the purpose of various operating systems (e.g., Windows, Mac, iOS, Android and Linux).
	20.06	Describe the difference between client and network operating systems.
	20.07	Differentiate between different operating systems and applications and Macros.
	20.08	Explain the basics of boot sequences, methods and startup utilities.
	20.09	Compare and contrast open source and proprietary software.
	20.10	Describe common system utilities used in performing computer maintenance.
21.0	Demonstrate an understanding of the Open Systems Interconnection (OSI) model. The student will be able to	
	21.01	Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.
	21.02	Describe the purpose of the OSI model and each of its layers.
	21.03	Explain specific functions belonging to each OSI model layer.
	21.04	Understand how two network nodes communicate through the OSI model.
	21.05	Discuss the structure and purpose of data packets and frames.
	21.06	Describe the two types of addressing covered by the OSI model.
22.0	Demonstrate an understanding of the TCP/IP model. The student will be able to:	
	22.01	Explain the interrelations of the four layers of the TCP/IP model as it relates to hardware and software.
	22.02	Describe the purpose of the TCP/IP model and each of its layers.
	22.03	Explain specific functions belonging to each TCP/IP model layer.

	22.04 Understand how two network nodes communicate through the TCP/IP model.
	22.05 Describe the two types of addressing covered by the TCP/IP model.
23.0	Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model. The student will be able to:
	23.01 Describe the services and protocols used in the OSI Application Layer (i.e., DHCP, DNS, FTP, HTTP, SMTP, Telnet, IMAP).
	23.02 Describe the services and protocols used in the OSI Transport Layer (i.e., TCP, TLS/SSL, UDP).
	23.03 Describe the services and protocols used in the OSI Network Layer (i.e., IP, ICMP, IGMP, IPsec).
	23.04 Describe the services and protocols used in the OSI Data Link Layer (i.e., ARP, OSPF, L2TP, PPP).
24.0	Demonstrate proficiency using computer networks. The student will be able to:
	24.01 Define networking and describe the purpose of a network.
	24.02 Describe the conceptual background of digital networks and cloud computing including terminology and basics.
	24.03 Describe various types of networks and the advantages and disadvantages of each (e.g. peer-to-peer, client/server, ROI).
	24.04 Describe the use, advantages, and disadvantages of various network media (e.g. coaxial, twisted pair, fiber optics).
	24.05 Describe the function of various network devices (e.g. hub, switched hub or switch, router, bridge, gateway, access points).
	24.06 Describe how network devices are identified (i.e., IP addressing).
	24.07 Explain the protocols commonly used in a network environment.
	24.08 Differentiate between public and private IP addresses.
	24.09 Describe the common ports and corresponding protocols used in a network.
	24.10 Describe the difference between the Internet and intranet.
	24.11 Compare and contrast IP Version 4 (IPv4) and IP Version 6 (IPv6).
	24.12 Compare and contrast the different methods for network connectivity (e.g. broadband, wireless, Bluetooth, cellular).
	24.13 Discuss the differences between Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Virtual Local Area Network (VLAN), and Virtual Private Network (VPN).
25.0	Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections. The student will be able to:
	25.01 Describe the various types of cloud computing (IaaS, PaaS, SaaS) and modes of delivery (Public, Private, Community, Hybrid).
	25.02 Describe practices that aid in protecting the Hybrid cloud model.
	25.03 Describe the challenges and solutions associated with securing embedded devices.
26.0	Demonstrate an understanding of basic security concepts. The student will be able to:

	26.01	Distinguish between vulnerability and a threat.
	26.02	Discuss the different types of attacks (e.g., active, passive).
	26.03	Define security policy and explain its role in cybersecurity.
	26.04	Describe the basic methods of authentication (e.g., password, biometrics, smart cards, two-factor authentication, multifactor authentication).
	26.05	Describe the various forms of encryption methodologies (e.g., symmetric, asymmetric, block cipher, stream cipher).
	26.06	Describe hash functions and their role in authentication.
	26.07	Describe various method of access control used in computer security (e.g., policies, groups, Access Control List (ACL)).
	26.08	Understand the concept of malware (i.e., ransomware, worms, viruses, adware) and how attackers use it to steal sensitive or confidential information.
27.0	Demonstrate an understanding of legal and ethical issues in cybersecurity. The student will be able to:	
	27.01	Define cybercrime and discuss the challenges facing law enforcement.
	27.02	Identify the key legislative acts that impact cybersecurity.
	27.03	Describe the Federal criminal code related to computers and give examples of cybercrimes and penalties, particularly those involving inappropriate access.
	27.04	Discuss the concept of digital forensics and its place in cybercrime investigations and incident response.
	27.05	Distinguish among the Intellectual Property Rights of trademark, patent, and copyright.
	27.06	Explain digital rights management and the implications of the Digital Millennium Copyright Act (DMCA).
	27.07	Describe the implications of various social media on the safeguarding of personal or sensitive information.
	27.08	Describe various safeguards that can be employed to help ensure that sensitive or confidential information is not inadvertently divulged or obtained.
28.0	Demonstrate an understanding of virtualization technology. The student will be able to:	
	28.01	Define virtual computing.
	28.02	Explain the benefits of virtual computing.
	28.03	Differentiate between guest and host operating systems.
	28.04	Install desktop virtualization software.
	28.05	Describe the role of the hypervisor.
	28.06	Create and upgrade a virtual machine.
	28.07	Optimize the performance of a virtual machine.
	28.08	Preserve the state of a virtual machine.

	28.09	Clone, move and share virtual machines.
	28.10	Use basic(static) and dynamic virtual disks and disk drives.
	28.11	Configure a virtual network.
	28.12	Connect devices to a virtual machine.
	28.13	Enable security settings on a virtual machine.
29.0	Recognize and understand the administration of the following types of remote access technologies. The student will be able to:	
	29.01	Configure 802.1x authentication for a given scenario.
	29.02	Connect clients to a VPN.
	29.03	Understand Authentication, Authorization and Accounting (AAA) management.
	29.04	Differentiate between TACACS+ (Terminal Access Controller Access Control System) and RADIUS.
	29.05	Differentiate between Layer 2 Tunneling Protocol (L2TP) and Point-to-Point Tunneling Protocol (PPTP) protocols as they apply to VPN options.
	29.06	Implement the use of SSH (Secure Shell).
	29.07	Implement the use of IPsec (Internet Protocol Security).
	29.08	Identify vulnerabilities associated with authentication.
	29.09	Understand ways to implement VoIP technologies.
	29.10	Demonstrate the use and purpose of Kerberos.
30.0	Understand the application of the following concepts of physical security. The student will be able to:	
	30.01	Configure access controls including biometric devices, keypads and security tokens.
	30.02	Recognize social engineering attempts.
	30.03	Evaluate environmental controls (e.g., EMI shielding, temperature, humidity and fire suppression).
	30.04	Develop a method of training users to recognize, report and avoid social engineering attempts.
	30.05	Identify components of physical security including: mantraps, motion detection, alarm systems, locks, video surveillance, and fences/barricades.
	30.06	Install a camera for a video surveillance system.
	30.07	Configure an alarm system including a keypad and motion detector.
	30.08	Recognize vulnerabilities associated with physical security.
	30.09	Explain how a mantrap is used as a counter measure against tailgating.
31.0	Securely configure and maintain the following types of devices. The student will be able to:	

	31.01 Configure and maintain software and hardware firewalls.
	31.02 Configure and secure routers.
	31.03 Apply security settings to switches.
	31.04 Configure and secure wireless devices.
	31.05 Secure a LAN connected to a DSL/cable modem.
	31.06 Configure a RAS (Remote Access Server) for remote connectivity.
	31.07 Securely deploy a PBX (Private Branch Exchange).
	31.08 Explain the benefits of implementing a VPN (Virtual Private Network).
	31.09 Deploy IDS (intrusion detection system) and IPS (intrusion prevention systems).
	31.10 Analyze the performance, efficiency and security of the network based on network monitoring and diagnostic software.
	31.11 Employ techniques used to lock down workstations.
	31.12 Configure and secure servers for a given scenario.
	31.13 Understand and assess the security of mobile devices including but not limited to those using the Android, iOS and Windows platforms.
32.0	Understand the societal and security challenges of emerging technologies. The student will be able to:
	32.01 Explain the security implications of the Internet of Things (IoT) (e.g., understand the efforts to address authentication and updates to IoT devices).
	32.02 Explain societal and security challenges associated with robotics.
	32.03 Explain security challenges associated with serverless computing.
	32.04 Explain societal and security challenges associated with the implementation of 5G.
	32.05 Describe and explain the security challenges of Autonomous vehicles (i.e., the significance of vehicular cybersecurity and its relation to: computer vision, artificial intelligence, machine learning and Deep learning.)
33.0	Recognize and be able to differentiate and explain the following access control models. The student will be able to:
	33.01 Understand access control as it applies to MAC (Mandatory Access Control).
	33.02 Understand access control as it applies to DAC (Discretionary Access Control).
	33.03 Understand access control as it applies to RBAC (Role Based Access Control).
34.0	Understand the security concerns for the following types of media. The student will be able to:
	34.01 Understand and identify security concerns with the use of Coaxial Cable.
	34.02 The student should be able to identify and understand security concerns for UTP/STP (Unshielded Twisted Pair / Shielded Twisted Pair).

	34.03 Identify and understand security concerns fiber optic cable.
	34.04 Identify security concerns associated with removable media.
	34.05 Address pitfalls associated with tape backups.
	34.06 Apply drive encryption to hard drives.
	34.07 Secure flash drives.
	34.08 Smartcards and secure USB memory.
35.0	Explain the following security topologies as they relate to cybersecurity. The student will be able to:
	35.01 Determine Security Zones.
	35.02 Point out vulnerabilities on a DMZ (Demilitarized Zone).
	35.03 Explain the security benefits of using an intranet.
	35.04 Explain the security benefits of using an extranet.
	35.05 Secure a VLAN (Virtual Local Area Network).
	35.06 Describe the security benefits associated with NAT (Network Address Translation).
	35.07 Justify the implementation of tunneling, for security purpose.
36.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	36.01 Describe the nature and types of business organizations.
	36.02 Explain the effect of key organizational systems on performance and quality.
	36.03 List and describe quality control systems and/or practices common to the workplace.
	36.04 Explain the impact of the global economy on business organizations.
	36.05 Display proficiency in using team-oriented collaboration and video teleconferencing software (e.g. Teams, Zoom).
37.0	Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges. The student will be able to:
	37.01 Explain the various elements that make up the security taxonomy used by the U.S. Computer Emergency Readiness Team (CERT).
	37.02 Describe the challenges associated with achieving and maintaining computer security.
	37.03 Discuss the range of potential consequences of various forms of security breaches.
	37.04 Describe various defense mechanisms, techniques, and methodologies (e.g., antivirus, anti-malware, protocol analyzers and scans, analyzing email headers, patch management).
	37.05 Compare and contrast mechanisms employed in passive and active cyber-attacks.

	37.06	Describe vulnerabilities associated with each element of the CIA Triad.
	37.07	Explain the differences between hardware, software, data, and network assets susceptible to cyber-attack.
	37.08	Describe the tools and technologies used in cybersecurity.
	37.09	Define intrusion detection and discuss its role in cybersecurity (e.g., HIDS and NIDS).
	37.10	Explain what is meant by the term countermeasures (e.g., NIPS and HIPS).
	37.11	Describe the role recovery plays in cybersecurity (e.g., Business Continuity Plan).
38.0	Demonstrate an understanding of common information and computer system security vulnerabilities. The student will be able to:	
	38.01	Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, organizational).
	38.02	Describe the ways in which various social networks are cybersecurity targets.
	38.03	Describe footprinting and explain how it is used to reveal system vulnerabilities.
	38.04	Explain why default values and technical controls are points of vulnerability and describe the hardening efforts being taken by government and industry.
	38.05	Describe the process of port scanning and explain why it is so prevalent in cybersecurity.
	38.06	Describe what is meant by password strength and explain its relationship to vulnerability.
	38.07	Distinguish between a weak and a strong password.
	38.08	Describe some of the ways in which intruders can cover their tracks.
	38.09	Describe the circumstances under which a computer system is vulnerable to a denial of service attack.
39.0	Demonstrate an understanding of common cyber-attack mechanisms, their consequences, and motivation for their use. The student will be able to:	
	39.01	Describe spoofing as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.02	Describe the introduction of malware or spyware as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.03	Describe the use of grayware as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.04	Describe the use of computer viruses or worms as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.05	Describe Logic Bombs as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.06	Describe botnet and rootkit as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.07	Describe the introduction of a Trojan Horse as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.08	Describe DNS poisoning as an attack mechanism and discuss its consequences and common motivating factors for its use.

	39.09 Describe buffer overflow as an attack mechanism and discuss its consequences and common motivating factors for its use.
	39.10 Understand the risk associated with a zero-day exploit.
	39.11 Understand risks associated with P2P networking including the Gnutella protocol and Torrents.
	39.12 Describe the use of ransomware as an attack mechanism and discuss its consequences and common motivating factors for its use.
40.0	Be able to identify and explain the following different kinds of cryptographic algorithms. The student will be able to:
	40.01 Hashing Functions.
	40.02 Symmetric Keys.
	40.03 Asymmetric Keys.
41.0	Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity. The student will be able to:
	41.01 Network steganographic methods (e.g., WLAN).
	41.02 Digital steganographic methods (e.g., image encryption, audio, mimic functions, video, packet manipulation).
	41.03 Understand how steganographic methods are used in malware.
42.0	Understand how cryptography and digital signatures address the following security concepts. The student will be able to:
	42.01 Confidentiality.
	42.02 Integrity.
	42.03 Authentication.
	42.04 Non-Repudiation.
	42.05 Access Control.
43.0	Understand and be able to explain the following concepts of PKI (Public Key Infrastructure). The student will be able to:
	43.01 Certificates (e.g., policies, practice statements).
	43.02 Revocation.
	43.03 Trust Models.
44.0	Demonstrate an understanding of certificates and their role in cybersecurity. The student will be able to:
	44.01 Describe the role of a Certificate Authority (CA).
	44.02 Describe Registration Authority (RA) and its relevance to security certificates.
	44.03 Compare and contrast SSL/TSL X.509-compliant certificates with PGP-compliant certificates.
	44.04 Describe the events that make up the lifecycle of a certificate.

	44.05 Describe how root certificate distribution works.
	44.06 Describe the role of a Certificate Revocation List (CRL).
	44.07 Describe the role of the Online Certificate Status Protocol (OCSP).
45.0	Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation. The student will be able to:
	45.01 Define intrusion.
	45.02 Describe the classes of intruders (i.e., masquerader, misfeasor, clandestine user).
	45.03 Describe what is meant by a hacker and discuss their role in cybersecurity.
	45.04 Compare and contrast the “black hat”, “white hat”, “blue hat”, and “grey hat” hacker cultures (i.e., computer criminal versus computer security expert).
	45.05 Describe various techniques used by hackers to achieve intrusion.
	45.06 Describe the difference between an inside and an outside attack.
46.0	Demonstrate an understanding of Intrusion Detection Systems (IDS). The student will be able to:
	46.01 Describe the three logical components of IDS (i.e., sensors, analyzers, user interface).
	46.02 Explain how user behavior relates to the detection of an intruder.
	46.03 Describe the essential requirements for any IDS.
47.0	Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
	47.01 Describe anomaly detection, specifically threshold and profile-based approaches.
	47.02 Describe the types of audit records employed in intrusion detection (i.e., native, detection-specific).
	47.03 Describe signature detection, specifically rule-based anomaly and penetration identification approaches.
48.0	Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
	48.01 Describe the primary approach for intrusion detection in a network.
	48.02 Compare and contrast inline and passive sensors.
	48.03 Discuss typical placement of sensors in a network-based IDS environment and explain the rationale for each.
49.0	Demonstrate an understanding of IDS applications. The student will be able to:
	49.01 Describe the operation, typical activities, and outputs of an intrusion detection system.
	49.02 Describe some of the limitations of intrusion detection systems.
	49.03 Differentiate between an intrusion detection system (passive) and an intrusion prevention (reactive) system.
	49.04 Compare and contrast several of the intrusion detection systems available on the current market.

50.0	Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques. The student will be able to:
	50.01 Describe the process of monitoring/detecting port scanning attacks and associated patterns.
	50.02 Explain how the monitoring and analysis of network traffic can be used to detect intrusion.
	50.03 Utilize network monitoring and analysis tools to detect intrusion and anomalies.
51.0	Demonstrate an understanding of firewalls and other means of intrusion prevention. The student will be able to:
	51.01 Describe the purpose and limitations of firewalls.
	51.02 Describe the four types of firewalls (i.e., packet filtering, stateful inspection, application-level gateway, circuit-level gateway).
	51.03 Describe the use of honeypots as an intrusion prevention technique.
	51.04 Explain how security policies are used to prevent intruders.
	51.05 Explain how Access Control Lists (ACLs) are used to prevent intrusion.
52.0	Demonstrate an understanding of vulnerabilities unique to virtual computing environments. The student will be able to:
	52.01 Describe the limitations of traffic monitoring within virtual networks.
	52.02 Discuss the primary vulnerability of virtual operating systems.
	52.03 Describe the “hypervisor” and explain its role in securing a virtual environment.
53.0	Demonstrate an understanding of social engineering and its implications to cybersecurity. The student will be able to:
	53.01 Define social engineering and describe its role in cybersecurity.
	53.02 Discuss common mechanisms that constitute social engineering (e.g., phishing, baiting, quid pro quo, pretexting).
	53.03 Describe the variety of attacks targeting the human element.
	53.04 Describe countermeasures that can be used to counter social engineering attacks.
54.0	Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability. The student will be able to:
	54.01 Discuss the three over-arching security design principles (i.e., only necessary, simple, ease of use).
	54.02 Describe the principle of least privilege as it relates to computer security.
	54.03 Describe the principle of separation of duties as it relates to computer security.
	54.04 Describe the principle of defense in depth as it relates to computer security.
	54.05 Describe the principle of fail secure or fail safe and false positive or false negative as it relates to computer security.
	54.06 Describe the principle of economy of mechanism as it relates to computer security.
	54.07 Describe the principle of complete mediation as it relates to computer security.

	54.08 Describe the principle of open design as it relates to computer security.
	54.09 Describe the principle of least common mechanism as it relates to computer security.
	54.10 Describe the principle of psychological acceptability as it relates to computer security.
	54.11 Describe the principle of leveraging existing components as it relates to computer security.
	54.12 Describe the principle of weakest link as it relates to computer security.
	54.13 Describe the principle of single point of failure as it relates to computer security.
55.0	Demonstrate an understanding of how to configure host systems to guard against cyber intrusion. The student will be able to:
	55.01 Describe the security features and options available for configuring network routers to prevent intrusion.
	55.02 Describe the various types of firewalls (i.e., packet filtering, stateful, application-level gateway, circuit-level gateway) and how each can be used to prevent intrusion.
	55.03 Explain the configuration and operation of a Demilitarized Zone (DMZ) host, including the key services contained within the zone.
	55.04 Describe the role of security zones, content filters, subnets, and trusted zones in configuring a network infrastructure.
56.0	Demonstrate an understanding of authentication methods and strategies. The student will be able to:
	56.01 Describe the strengths, vulnerabilities, and countermeasures related to the use of passwords for authentication.
	56.02 Describe ways in which passwords are compromised and techniques/models for strengthening.
	56.03 Explain token authentication methods (e.g., memory cards, smart cards) and limitations.
57.0	Demonstrate an understanding of methods and strategies for controlling access to computer networks. The student will be able to:
	57.01 Compare and contrast the three primary categories of access control (i.e., discretionary, mandatory, role-based).
	57.02 Describe the underlying principles of authorization as an access control mechanism applicable to individuals, system services, subjects, objects.
	57.03 Discuss the key features of an access control system (i.e., reliable input, granularity, least privilege, separation of duty, open/close policies, conflict resolution, administration).
	57.04 Describe the three elements of access control (i.e., subject, object, rights).
	57.05 Describe access rights (i.e., read, write, execute, delete, create, search) and their use in establishing individual and group access control policies.
	57.06 Compare and contrast the use, operation, and limitations of Access Control Matrix (ACM), Access Control Lists (ACLs), and Capability Tickets in a network environment.
	57.07 Describe the UNIX file access control schema.
	57.08 Explain the relationship between security policies and access control.
	57.09 Describe the use and conceptual operation of formal security policy models (e.g., Bell-La Padula (BLP), Chinese Wall Model (CWM), Harrison Ruzzo Ullman (HRU)).

	57.10	Describe the use, strengths, and vulnerabilities of group policies in access control and strategies for ensuring safety.
	57.11	Describe the key entities, relationships, and functions that comprise Role-Based Access Control (RBAC), including privilege management considerations.
58.0	Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured. The student will be able to:	
	58.01	Describe the operation of Dynamic Host Configuration Protocol (DHCP), its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	58.02	Describe the operation of the Domain Name System (DNS) service, its role in a network environment, its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	58.03	Describe the operation of the Simple Mail Transport Protocol (SMTP), its role in a network environment, its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	58.04	Describe the operation of the File Transfer Protocol (FTP) and Telnet, their role in a network environment, their vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
59.0	Demonstrate an understanding of the processes involved in hardening a computer system or network. The student will be able to:	
	59.01	Describe hardening and some of the general approaches for securing a computer network.
	59.02	Describe and apply the process by which a web server is hardened against their typical cyber-attacks.
	59.03	Describe and apply the process by which a mail server is hardened against their typical cyber-attacks.
	59.04	Describe and apply the process by which a FTP server is hardened against their typical cyber-attacks.
	59.05	Describe and apply the process by which a file/print server is hardened against their typical cyber-attacks.
	59.06	Describe and apply the process by which data repositories are hardened against their typical cyber-attacks.
	59.07	Describe and apply the process by which Directory Services is hardened against their typical cyber-attacks.
	59.08	Describe and apply the process by which various network appliances are hardened against their typical cyber-attacks.
60.0	Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations. The student will be able to:	
	60.01	Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.
	60.02	Describe key escrow, its role in key management, its advantages, and its risks.
	60.03	Differentiate between key backup and key escrow.
	60.04	Explain the role of a key's expiration date, its implications on the key's validity, and its relationship to deactivation.
	60.05	Describe the circumstances under which a key might be revoked, who has authority to revoke a key, and how revocation is communicated.
	60.06	Compare and contrast key suspension and key revocation.
	60.07	Describe ways in which key recovery might be achieved, who is authorized to recover keys, and associated vulnerabilities to attack.

	60.08	Compare and contrast key renewal and key replacement, who is authorized to initiate renewal or replacement, and associated vulnerabilities to attack.
	60.09	Describe the circumstances under which a key might be destroyed, the considerations prior to destruction, and associated vulnerabilities to compromise or attack.
61.0	Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization. The student will be able to:	
	61.01	Describe the process of asset identification relative to risk assessment and the considerations or criteria used in identifying assets requiring protection and understand how to leverage a configuration management database (CMDB) for asset management.
	61.02	Describe the process of threat identification, including identifying the types of threats, asset vulnerabilities, and threat sources.
	61.03	Describe the process of risk assessment, including determination of attack probability, attack consequences, and assignment of risk priorities.
	61.04	Evaluate an existing security posture and identify gaps and vulnerabilities in security.
	61.05	Describe the role of governance, risk, and compliance in achieving a more secure organization.
	61.06	Describe the concepts of Key Performance Indicators and Risk Measurement. (e.g., annualized loss expectancy (ALE), annual rate of occurrence (ARO), single loss expectancy (SLE), Exposure Factor (EF).)
	61.07	Analyze and apply data and measurements to solve business problems and relate it to IT risk and business continuity.
62.0	Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes. The student will be able to:	
	62.01	Describe the types of penetration tests (i.e., human, physical, wireless, data networks, telecommunications), the goals of each type, the metrics tested, and the value of their results.
	62.02	Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
	62.03	Define attack vector and explain its relationship and importance to penetration testing.
	62.04	Describe common testing methodologies and standards used in penetration testing.
	62.05	Describe the salient points, structure, detail, and documentation typically addressed in reporting and debriefing the results of penetration testing.
	62.06	Detect malicious and abnormal activities through logs, intrusion detection systems, and other utilities and appliances.
	62.07	Reproduce methods that intruders use to gain unauthorized access to a network system for purposes of compromising information assets.
	62.08	Deploy proprietary and/or open source tools to test known technical vulnerabilities in networked systems.
	62.09	Determine which vulnerabilities are exploitable and estimate the risk and impact of potential exploitations.
	62.10	Recommend appropriate mitigation procedures against discovered vulnerabilities and security gaps.
	62.11	Model the ethics of a licensed Penetration Tester or Computer Security Specialist.
63.0	Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase. The student will be able to:	

63.01	Describe the activities that make up the Preparation Phase of the Incident Response Life Cycle (e.g., identification of useful tools and resources, setting up a war room, securing communications, creating a governance team, identifying key stakeholders for response activities.)
63.02	Describe the activities that make up the Detection and Analysis Phase of the Incident Response Life Cycle, including identification of indication sources, analysis of resulting signs of an intrusion event, documentation and notification of the incident.
63.03	Describe the factors to consider when prioritizing an incident.
63.04	Describe the activities that make up the Containment, Eradication, and Recovery Phase of the Incident Response Life Cycle, including selecting a containment strategy, collecting and preserving evidence for forensic analysis, identifying the attacker, re-securing the system and system restoration.
63.05	Describe the activities that make up the Post Incident Activity Phase of the Incident Response Life Cycle, including identification of lessons learned and evidence retention.

Course Number: CTS0019 Occupational Completion Point: B Information Security Manager – 150 Hours	
64.0	Demonstrate proficiency in cybersecurity risk mitigation planning. The student will be able to:
64.01	Describe the major activities and security controls that are implemented as part of a sound risk management program.
64.02	Discuss the rationale for executive sponsorship and delineated management responsibilities in successfully implementing a risk management program.
65.0	Demonstrate proficiency in establishing a risk management framework. The student will be able to:
65.01	Describe the importance of creating a system definition for use in assessing vulnerabilities and risks.
65.02	Describe the major elements of a system definition.
65.03	Differentiate among critical assets, cyber assets, and critical cyber assets.
65.04	Explain why cyber assets are classified as public, restricted, confidential, or private and why this plays a role in creating a risk management framework.
65.05	Compare and contrast the classes of cyber assets (i.e., public, restricted, confidential, private) and give examples of each.
65.06	Create a system definition that identifies all cyber assets, their class, and their risk category (e.g., critical).
65.07	Describe an Electronic Security Perimeter (ESP) and discuss its role in formulating a risk management framework.
65.08	Describe the process and goals of a vulnerability assessment of ESP access points.
65.09	Define risk level and explain the variabilities of its components.
65.10	Describe ways in which system vulnerability may be ranked according to impact (e.g., safety, outage, privacy, monetary).
65.11	Describe some of the security controls (e.g., access control, training, audit, configuration, maintenance) that come into play when determining the appropriate risk mitigation strategy.

	65.12 Compare and contrast a top-down and a bottoms-up analysis approach for identifying and mitigating risks.
	65.13 Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
	65.14 Create a risk management framework.
66.0	Demonstrate proficiency in creating a corporate security policy. The student will be able to:
	66.01 Describe the best practices and security controls that typify a sound corporate security policy.
	66.02 Discuss the elements of a corporate security policy, including policy management, personnel and training, critical asset management, ESP, physical security, incident reporting and response, disaster recovery and business continuity plans.
	66.03 Describe the need for specific implementation and enforcement processes as part of a corporate security policy.
	66.04 Explain the controls required for addressing personnel risks in a corporate security policy (e.g., training, hiring due diligence, enforcement of “least privilege,” access revocation).
67.0	Demonstrate proficiency in addressing process risks. The student will be able to:
	67.01 Describe the best practices and security controls typically implemented for assessing and mitigating operational risks, including:
	• Conduct periodic posture risk assessments.
	• Enforce access control, monitoring, and logging.
	• Perform disposal/redeployment of assets.
	• Enforce change control and configuration management.
	• Conduct vulnerability assessments.
	• Control, Monitor, and log all access to assets.
	• Configuration and maintenance.
	• Ensure incident-handling processes.
	• Provide for contingency planning.
	67.02 Create an organized mitigation table that identifies operational or process risks, the potential impact of the risk, and specific actions required to mitigate the risk.
68.0	Demonstrate proficiency in addressing physical security risks. The student will be able to:
	68.01 Describe the best practices and security controls that ensure good physical security of critical infrastructure and assets.
	68.02 Discuss the resulting potential for compromise once physical security is breached.
	68.03 Create an organized mitigation table that identifies physical security risks, the potential impact of the risk, and specific actions required to mitigate the risk.
69.0	Demonstrate proficiency in cybersecurity contingency planning. The student will be able to:
	69.01 Define resiliency and its relationship to contingency planning.

	69.02	Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
	69.03	Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, and Appendices).
	69.04	Describe the contingency planning process and the rationale for each step in the process.
	69.05	Explain the three step process for conducting a business impact analysis (i.e., determine recovery criticality, identify resource requirements, identify recovery priorities).
	69.06	Compare and contrast Maximum Tolerable Downtime (MTD), Recovery Time Objective (RTO), and Recovery Point Objective (RPO).
	69.07	Discuss the criteria typically used to activate the contingency plan.
	69.08	Discuss the role of backup and recovery considerations in contingency planning.
	69.09	Create a contingency plan that includes roles and responsibilities, a business impact analysis with contingency strategies/solutions, outage assessment, resource recovery priorities, backup and recovery strategies, and testing/training considerations.
70.0	Demonstrate proficiency in cybersecurity disaster recovery planning. The student will be able to:	
	70.01	Describe the purpose and scope of a cybersecurity disaster recovery plan.
	70.02	Describe various recovery strategies according to their appropriateness.
	70.03	Explain the key considerations when formalizing a disaster recovery plan.
	70.04	Discuss the role of data collection relative to disaster recovery.
	70.05	Identify the types, purposes, and role of documentation during disaster recovery.
	70.06	Discuss the role of testing in a disaster recovery plan.
71.0	Demonstrate proficiency in cybersecurity business continuity planning. The student will be able to:	
	71.01	Describe the purpose and scope of a cybersecurity business continuity plan.
	71.02	Explain the concept of fault tolerance and discuss its role in business continuity planning.
	71.03	Identify and use various utilities employed for the purpose of business continuity.
	71.04	Describe the role of backups for ensuring business continuity.
72.0	Demonstrate proficiency in the essential elements of forensic analysis. The student will be able to:	
	72.01	Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	72.02	Describe the forensic and evidentiary considerations when determining containment.
	72.03	Describe the types and sources of data collected for forensic analysis.
	72.04	Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
	72.05	Explain the processes by which data is collected for analysis.

	72.06 Describe the role of system event logs in data collection.
	72.07 Describe the role of the process log in data collection.
	72.08 Describe the processes associated with preserving evidence collected for forensic purposes.
	72.09 Describe how the chain of custody can be maintained for evidence collected during a forensic analysis effort.
Course Number: CTS0021 Occupational Completion Point: B Data Security Specialist – 150 Hours	
73.0	Demonstrate an understanding of database design, structure, and operation. The student will be able to:
	73.01 Describe a relational database and its key elements.
	73.02 Describe the Entity Relationship Model (ERM) and relate how it is a factor in database security.
	73.03 Describe the process of normalization and explain its role in database security.
	73.04 Differentiate between one-to-many, many-to-many and one-to-one relationships.
	73.05 Define referential integrity and describe its implications on database security.
	73.06 Discuss the role of authentication in database security.
74.0	Demonstrate a fundamental understanding of Structured Query Language (SQL). The student will be able to:
	74.01 List the capabilities of SQL SELECT statements.
	74.02 Execute basic SQL statements, including SELECT, INSERT, and UPDATE.
	74.03 Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
	74.04 Use column aliases to rename columns in the query result.
	74.05 Use SQL to display the structure of a table.
	74.06 Apply SQL syntax to restrict the rows returned from a query.
	74.07 Demonstrate application of the WHERE clause syntax.
	74.08 Apply the proper comparison operator to return a desired result.
	74.09 Create, drop, rename and truncate tables using SQL.
	74.10 Create and remove an index using a SQL statement.
	74.11 Create or modify users and roles using SQL statements.
	74.12 Use the GRANT and REVOKE SQL statements to control access.

	74.13 Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML) SQL statements and discuss their respective implications to database security.
75.0	Demonstrate an understanding of database security policies. The student will be able to:
	75.01 Explain the role of the Database Management System (DBMS) in maintaining database security.
	75.02 Describe three aspects of system level security related to databases (i.e., user privilege schema, user authentication, operating system level privileges).
	75.03 Describe the mechanisms that control access to and use of the database at the object level.
	75.04 Explain how role-based privilege assignment can be used as a data security model.
	75.05 Compare and contrast the implications of connecting to a database with administrator versus user privileges.
76.0	Demonstrate an understanding of database access control, functions, methods, and verification. The student will be able to:
	76.01 Compare and contrast rights and privileges as they relate to database security.
	76.02 Describe the manner in which database user rights and privileges are controlled (e.g., granted, revoked).
	76.03 Describe application access rights and discuss their role in a database security schema.
	76.04 Compare and contrast table, column, and row level security, including VIEW implications.
	76.05 Describe fine-grained access control and its use in database security.
	76.06 Describe the operation of a database firewall and explain its role in a database security schema.
	76.07 Describe how database security policies may be used to trigger security auditing events.
	76.08 Describe the various types of auditing (e.g., statement, privilege, object, fine-grained) and associated records.
77.0	Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures. The student will be able to:
	77.01 Describe the SQL Injection attack vector and explain its potential consequences (e.g., privilege escalation, data compromise, data destruction).
	77.02 Describe database inference as a vulnerability and explain how sensitive information can be compromised inadvertently.
	77.03 Discuss ways in which to prevent or limit database inference at design time and query time.
	77.04 Compare and contrast the various countermeasures and strategies to prevent an SQL injection from being successful.
	77.05 Compare and contrast the ways in which encryption might be applied to a database (i.e., database, fields, records, columns) and discuss the tradeoffs of each.
78.0	Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery. The student will be able to:
	78.01 Describe the criteria that might be employed to trigger an intrusion or breach alarm.
	78.02 Identify the sources for confirming and tracking intrusion.
	78.03 Describe the tools and methodologies used to determine the scope of data compromise.

	78.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
	78.05 Describe the appropriate actions related to database recovery during incidence response.
Course Number: CTS0060 Occupational Completion Point: B Software Security Specialist – 150 Hours	
79.0	Demonstrate an understanding of software design, structure, and operation. The student will be able to:
	79.01 Describe a typical software application and its key elements.
	79.02 Compare and contrast software quality and software security in terms of development time, testing, and implementation.
	79.03 Explain how security can be a software design parameter and discuss the inherent trade-offs during the development life cycle.
	79.04 Describe the common failings in software security (e.g., input handling, inadequate testing, incomplete/incorrect algorithms, memory misuse, holes for privilege escalation).
80.0	Demonstrate a fundamental understanding of common software attack vectors. The student will be able to:
	80.01 Describe how buffer overflow attacks can be prevented through input validation and proper interpretation.
	80.02 Describe a command injection attack, how it can occur, and the potential consequences.
	80.03 Describe an SQL injection attack, how it can occur, and the potential consequences.
	80.04 Describe a code injection attack, including PHP remote code injection, how it can occur, and the potential consequences.
	80.05 Describe cross-site scripting attack, how it can occur, and the potential consequences.
81.0	Demonstrate an understanding input syntax validation. The student will be able to:
	81.01 Explain the need for validating input syntax to ensure proper input handling.
	81.02 Describe canonicalization and its role in handling alternate encoding schemas.
	81.03 Discuss the risks associated with improper handling of signed or unsigned numeric input (e.g., very large data length versus negative number).
82.0	Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code. The student will be able to:
	82.01 Explain why any input processing algorithm must correctly handle all problem variants.
	82.02 Explain why debug or test code should be removed from all production bound software.
	82.03 Describe the need for ensuring that machine instructions correctly implement the intended actions of the high-level language code.
	82.04 Describe the concept of a strongly typed programming language and explain its role in correct data interpretation.
	82.05 Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).

	82.06 Describe the race condition associated with shared memory access, its causes, and potential consequences (e.g., DOS attack causing deadlock).
83.0	Demonstrate an understanding of the role of environment variables in the operation of software applications. The student will be able to:
	83.01 Describe how the PATH, IFS, and LD_LIBRARY_PATH environment variables can be exploited.
	83.02 Explain how dynamic libraries can be subverted through the use of environment variables and describe the potential consequences (e.g., elevated privileges).
	83.03 Describe the principle of "least privilege" relative to the operation of software applications, particularly as it relates to file/directory ownership management.
84.0	Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks. The student will be able to:
	84.01 Describe a Root/Admin program and explain the development and operational benefits of partitioning the program into smaller modules.
	84.02 Identify the sources for confirming and tracking intrusion.
	84.03 Describe the tools and methodologies used to determine the scope of data compromise.
	84.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
	84.05 Describe the appropriate actions related to database recovery during incidence response.
Course Number: CTS0085 Occupational Completion Point: B Web Security Specialist – 150 Hours	
85.0	Demonstrate an understanding of the primary security services used in Internet and intranet environments. The student will be able to:
	85.01 Describe Secure Sockets Layer (SSL) security service.
	85.02 Compare and contrast SSL with Transport Layer Security (TLS) as a security service.
	85.03 Describe Internet Protocol Security (IPsec) and discuss its benefits and three functional areas (i.e., authentication, confidentiality, key management).
	85.04 Describe Secure/Multipurpose Internet Mail Extension (S/MIME) and discuss its role in achieving secure Internet-based communications.
86.0	Demonstrate a fundamental understanding of the SSL protocol stack and its elements. The student will be able to:
	86.01 Compare and contrast SSL Connection and SSL Session.
	86.02 Describe SSL Record Protocol services and discuss their role in managing SSL exchanges (i.e., message integrity, confidentiality).
	86.03 Describe the operation of the SSL Record Protocol, including the key steps that ensure security (e.g., adding message authentication code, encryption).
	86.04 Explain the role of the SSL Change Cipher Spec Protocol in ensuring secure transactions.

	86.05	Explain the role of the SSL Alert Protocol.
	86.06	Describe the SSL Handshake Protocol and explain the role of each phase of communication (i.e., establish security capability, server authentication/key exchange, client authentication/key exchange, complete secure connection).
87.0	Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms. The student will be able to:	
	87.01	Compare and contrast IPsec with SSL and TSL.
	87.02	Compare and contrast security services provided under IPv4 and IPv6.
	87.03	Differentiate between the three facilities available under IPsec (i.e., Authentication Header, Encapsulating Security Payload, key exchange).
	87.04	Describe the concept of Security Association (SA) and explain the roles of its three parameters (i.e., Security Parameters Index, IP Destination Address, Security Protocol Identifier).
	87.05	Describe the purpose, structure, and criteria of the Authentication Header (AH).
	87.06	Describe the purpose, structure, and elements of the Encapsulating Security Protocol (ESP).
	87.07	Describe the structure and operation of the key management facility of IPsec.
88.0	Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates. The student will be able to:	
	88.01	Describe the role of S/MIME in conducting email communications.
	88.02	Compare and contrast the four new security functions provided by S/MIME (i.e., enveloped data, signed data, clear-signed data, signed and enveloped data).
	88.03	Outline the process of using S/MIME during email processing.
	88.04	Describe the various cryptographic algorithms used by S/MIME and discuss their applicability (i.e., DSS, RSA, SHA-1, MD5, ElGamal, AES, 3DES, HMAC).
	88.05	Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).
	88.06	Describe the need for using x.509 v3 public key certificates with S/MIME.
89.0	Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network. The student will be able to:	
	89.01	Compare and contrast the roles and operation of a Kerberos Authentication Server (AS) and a Ticket Granting Server (TGS).
	89.02	Describe a Kerberos realm and the mechanism for inter-realm authentication.
90.0	Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains. The student will be able to:	
	90.01	Describe the key components of identity management architecture.
	90.02	Describe the concept of identity federation and explain its benefits.
	90.03	Describe the standards used in federated identity management (i.e., XML, SOAP, WS-Security, SAML).

Course Number: CTS0089 **Occupational Completion Point: B** **Information Security Administrator – 150 Hours**	
91.0	Complete a safety skills inventory. The student will be able to:
91.01	Practice safety procedures while enrolled in this course.
91.02	Demonstrate an understanding of safety and general policies and procedures.
92.0	Demonstrate acceptable project values. The student will be able to:
92.01	Maintain a positive relationship with peers.
92.02	Demonstrate adaptive self-management skills.
92.03	Adhere to industry accepted, legal, and ethical standards of cyber conduct.
92.04	Rotate through a wide variety of increasingly responsible experiences.
92.05	Apply superior skills in communications, mathematics, and science appropriate to technological content and learning activities.
93.0	Demonstrate the ability to detect and resolve system vulnerabilities. The student will be able to:
93.01	Prepare a vulnerability matrix to identify and record weak points, the type of vulnerability, significance of the vulnerability, the priority, and the solution.
93.02	Determine possible solutions for each vulnerability.
93.03	Research each detected vulnerability.
93.04	Document solutions as they are devised.
93.05	Prepare an alternative for any solution that is not successful.
93.06	Continue the process until a workable solution is found for each vulnerability.
94.0	Plan, organize, and carry out a penetration-testing plan. The student will be able to:
94.01	Determine the scope and attack vectors for the test.
94.02	Organize the team according to individual strengths.
94.03	Assign specific tasks within a team.
94.04	Prioritize the attack vectors and sequence the test.
94.05	Identify required resources.
94.06	Carry out the testing plan to successful completion.
94.07	Create the test report detailing the goals, tests, findings, and results.

95.0	Demonstrate proficiency in conducting forensic analysis. The student will be able to:
95.01	Create security incident handling and response policies.
95.02	Recover deleted, encrypted, or damaged file information as evidence for prosecution in computer crimes.
95.03	Deploy proprietary and/or open source tools to identify intruder footprints.
95.04	Coordinate incident response activities.
95.05	Prepare proper documentation of chain of custody, including accounting for evidence source, destination, and possession.
95.06	Preserve forensic integrity of evidence.
95.07	Model highest moral and ethical standards in conducting digital forensic investigations.
96.0	Successfully work as a member of a team. The student will be able to:
96.01	Accept responsibility for specific tasks in a given situation.
96.02	Document progress, and provide feedback on work accomplished in a timely manner.
96.03	Complete assigned tasks in a timely and professional manner.
96.04	Reassign responsibilities when the need arises.
96.05	Complete daily tasks as assigned on one's own initiative.
97.0	Manage time according to a plan. The student will be able to:
97.01	Set realistic time frames and schedules.
97.02	Record time worked in the daily journal.
97.03	Meet goals and objectives set by the team.
97.04	Identify individual priorities.
97.05	Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.
98.0	Keep acceptable records of progress problems and solutions. The student will be able to:
98.01	Develop a record keeping system in the form of a logbook or journal to record daily progress.
98.02	Use a project journal to identify problem statement.
98.03	Develop a portfolio of work accomplished to include design drawings, research, drawings and plans, storyboards, models, mock-ups and prototypes.
99.0	Manage resources. The student will be able to:
99.01	Identify required resources for each stage of the project plan.
99.02	Determine the methods needed to acquire needed resources.

	99.03 Demonstrate good judgment in the use of resources.
	99.04 Recycle and reuse resources where appropriate.
	99.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
100.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	100.01 Identify the proper tool for a given job.
	100.02 Use tools and machines in a safe manner.
	100.03 Adhere to laboratory or job site safety rules and procedures.
	100.04 Identify the application of processes appropriate to the task at hand.
	100.05 Identify materials appropriate to their application.
101.0	Research content related to the project and document the results. The student will be able to:
	101.01 Identify the basic research needed to develop the project plan.
	101.02 Identify available resources for completing background research required in the project plan.
	101.03 Demonstrate the ability to locate resource materials in a library, database, internet and other research resources.
	101.04 Demonstrate the ability to organize information retrieval.
	101.05 Demonstrate the ability to prepare a topic outline.
	101.06 Write a draft of the design and testing report.
	101.07 Edit and proof the respective report.
	101.08 Prepare an electronically composed report in proper form.
102.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
	102.01 Prepare a multi-media presentation on the completed project.
	102.02 Make an oral presentation, using multi-media materials.
	102.03 Review the presentation, and make changes in the delivery method(s) to improve presentation skills.
103.0	Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon. The student will be able to:
	103.01 Demonstrate a mastery of the content of the selected subject area.
	103.02 Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
	103.03 Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.

103.04 Demonstrate the acquisition of additional knowledge, skill and experience in one area of the selected field of study beyond the performance standards of the initial program standards.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

The standards and/or benchmarks for this program were updated for the 2026-27 academic year.

Program Title: **Cloud Computing & Virtualization**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y100400	
CIP Number	0511090200	
Grade Level	30, 31	
Program Length	900 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	Please see the Master Credential List for this program's assigned SOC codes. https://careersourceflorida.com/boardroom/florida-credentials-review-committee-draft/master-credentials-list/	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communication (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Computer Support Assistant, Network Support Technician, Cloud Specialist, Cloud Virtualization Engineer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of five occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	EEV0504	Computer Support Assistant	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	150 hours
C	CTS0026	Network Support Technician		150 hours
D	CTS0054	Cloud Analyst		150 hours
E	CTS0056	Cloud Virtualization Specialist		300 hours

Note: OTA0040 is a core.

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Incorporate appropriate leadership, customer-service strategies and professional ethics to enhance workplace performance.
17.0 Install, configure, and upgrade desktop and mobile computer systems following industry-standard procedures.
18.0 Diagnose and troubleshoot hardware, software, and connectivity problems.
19.0 Apply safety, maintenance, and environmental sustainability practices.
20.0 Demonstrate understanding of processors, memory and storage technologies.
21.0 Demonstrate knowledge of printing and imaging systems.
22.0 Demonstrate basic networking concepts and connectivity skills.
23.0 Provide effective end-user assistance.
24.0 Demonstrate proficiency using modern graphical user interfaces and productivity tools.
25.0 Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance.
26.0 Participate in work-based learning experiences.
27.0 Perform end-user support through multiple communication channels.
28.0 Install and configure operating systems and network services.
29.0 Demonstrate proficiency using network standards and protocols.
30.0 Configure and troubleshoot hardware devices and drivers.

31.0 Monitor and optimize system performance and reliability.
32.0 Manage and troubleshoot storage and user data.
33.0 Configure and troubleshoot network connections.
34.0 Implement and troubleshoot system and network security.
35.0 Demonstrate effective communication in technical environments.
36.0 Apply critical thinking and problem-solving skills.
37.0 Use information technology tools to enhance productivity and collaboration.
38.0 Describe organizational roles and team dynamics in IT environments.
39.0 Demonstrate professional ethics and legal responsibilities in IT support.
40.0 Evaluate and analyze cloud principles used in cloud computing.
41.0 Identify the components of cloud-based services.
42.0 Evaluate cloud-based services.
43.0 Use cloud-based services.
44.0 Evaluate and analyze techniques and methods of cloud deployment.
45.0 Evaluate the risks of cloud-based systems.
46.0 Demonstrate an awareness of cloud implementation.
47.0 Demonstrate an understanding of virtualization concepts.
48.0 Install and configure the virtualization server platform
49.0 Install, configure and manage virtualized clients.
50.0 Demonstrate proficiency in managing a virtualization infrastructure.
51.0 Demonstrate an understanding of storage technologies and storage configuration.
52.0 Demonstrate proficiency in network optimization using network protocols, ports, and topologies.
53.0 Understand security in a virtualized environment.

Florida Department of Education
Student Performance Standards

Program Title: Cloud Computing & Virtualization
Career Certificate Program Number: Y100400

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**	
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)	
Course Number: EEV0504 **Occupational Completion Point – B** **Computer Support Assistant – 150 Hours**	
16.0	Incorporate appropriate leadership, customer-service strategies and professional ethics to enhance workplace performance. The student will be able to:
16.01	Develop courteous, solution-focused communication methods when assisting customers.
16.02	Demonstrate teamwork, adaptability, and positive attitude in classroom or help-desk simulations.
16.03	Apply ethical and confidentiality standards when handling user data or credentials.
16.04	Document service requests and resolutions accurately using digital ticketing or workflow systems.
17.0	Install, configure, and upgrade desktop and mobile computer systems following industry-standard procedures. The student will be able to:
17.01	Identify major hardware components (motherboard, CPU, memory, storage, power, I/O devices) and describe their functions.
17.02	Recognize modern interface standards (USB-C, HDMI, DisplayPort, Bluetooth, Wi-Fi, Ethernet).
17.03	Assemble, disassemble, and reassemble systems safely using antistatic and ESD precautions.
17.04	Install and configure operating systems (Windows 10/11, Linux, macOS) and required drivers.
17.05	Perform system updates, backups, and recovery procedures.
17.06	Install productivity, collaboration, and endpoint-management applications.
17.07	Configure basic virtualization software for testing or lab use.
17.08	Customize user settings, accessibility features, and regional preferences.
17.09	Explain the importance of firmware/BIOS updates and secure-boot settings.

18.0	Diagnose and troubleshoot hardware, software, and connectivity problems. The student will be able to:
	18.01 Diagnose and troubleshoot hardware, software, and connectivity problems. The student will be able to:
	18.02 Apply structured troubleshooting methodologies to isolate faults.
	18.03 Use built-in diagnostics, system logs, and Task Manager to analyze performance issues.
	18.04 Troubleshoot startup failures, application crashes, and driver conflicts.
	18.05 Resolve common peripheral, display, and input/output problems.
	18.06 Identify symptoms of failing components and recommend replacement or repair.
	18.07 Diagnose basic network-connectivity issues using ping, ipconfig/ifconfig, and Wi-Fi utilities.
	18.08 Apply malware-removal and remediation techniques using approved tools.
19.0	Apply safety, maintenance, and environmental sustainability practices. The student will be able to:
	19.01 Follow safe tool usage, lifting, and electrical-safety guidelines.
	19.02 Perform routine cleaning, firmware updates, and hardware checks to maintain reliability.
	19.03 Dispose of electronic waste responsibly (batteries, toner, displays) per EPA and school-district standards.
	19.04 Apply ergonomic principles for workstation design and device placement.
	19.05 Secure devices and data using cable locks, privacy screens, and password protection.
20.0	Demonstrate understanding of processors, memory, and storage technologies. The student will be able to:
	20.01 Differentiate types and speeds of RAM, cache, and storage media (SSD, NVMe, cloud).
	20.02 Install and configure internal and external storage devices.
	20.03 Explain the relationship between CPU cores, threads, and virtualization features.
	20.04 Configure and verify disk partitions and file systems.
	20.05 Describe basic redundancy concepts such as RAID and cloud backup.
21.0	Demonstrate knowledge of printing and imaging systems. The student will be able to:
	21.01 Identify common printer types (laser, inkjet, thermal, multifunction) and their use cases.
	21.02 Install and configure printers locally and on a network.
	21.03 Troubleshoot print queues, driver mismatches, and connectivity issues.
	21.04 Implement environmentally responsible printing practices and consumable recycling.
22.0	Demonstrate basic networking concepts and connectivity skills. The student will be able to:

	22.01 Define networking and describe its purpose in a business environment.
	22.02 Identify the functions of key components (switches, routers, access points, cables).
	22.03 Explain network topologies, IP addressing, and common protocols (TCP/IP, DNS, DHCP).
	22.04 Connect and configure a workstation for wired and wireless access.
	22.05 Verify network connectivity and performance using diagnostic tools.
	22.06 Describe the importance of network security measures such as firewalls and encryption.
	22.07 Perform basic data-backup and restore operations using local or cloud storage.
	22.08 Explain the purpose of disaster-recovery planning and business-continuity concepts.
23.0	Provide effective end-user assistance. The student will be able to:
	23.01 Use professional communication and active-listening techniques when supporting users.
	23.02 Gather and record accurate problem details in a service ticket.
	23.03 Provide step-by-step guidance or remote assistance for basic issues.
	23.04 Escalate unresolved problems following established procedures.
24.0	Demonstrate proficiency using modern graphical user interfaces and productivity tools. The student will be able to:
	24.01 Navigate GUI environments and customize layouts for accessibility and efficiency.
	24.02 Use menus, ribbons, and keyboard shortcuts effectively.
	24.03 Organize and maintain file structures in local and cloud directories.
	24.04 Run multiple applications, manage windows, and multitask securely.
	24.05 Access help systems, documentation, and online knowledge bases for problem-solving.
Course Number: CTS0026 Occupational Completion Point – C Network Support Technician – 150 Hours	
25.0	Incorporate leadership, supervision, customer-service strategies, and ethical standards to enhance workplace performance. The student will be able to:
	25.01 Communicate professionally and diplomatically with customers and peers to resolve technical issues.
	25.02 Demonstrate integrity, confidentiality, and professional ethics when handling client information.
26.0	Participate in work-based learning experiences. The student will be able to:
	26.01 Participate in simulated or real network support projects using trouble-ticket systems and change-management workflows.
	26.02 Demonstrate the use of technology tools to support end-users, including remote-support and collaboration platforms.

27.0	Provide end-user support through multiple communication channels. The student will be able to:
	27.01 Perform first-response troubleshooting for hardware, software, and network issues via phone, email, chat, or remote desktop.
	27.02 Document incidents accurately and follow escalation procedures.
	27.03 Demonstrate effective listening and customer-service skills when assisting users.
28.0	Install and configure operating systems and network services. The student will be able to:
	28.01 Install, configure, and update client operating systems (Windows 10/11, Linux Mint/Ubuntu).
	28.02 Join workstations to a domain or directory service (Active Directory, Azure AD, or LDAP).
	28.03 Configure Internet connectivity and basic LAN parameters (IP, DNS, gateway).
	28.04 Deploy operating-system images using WDS, MDT, or cloning software.
	28.05 Install and configure network applications such as file sharing, printers, and web services.
	28.06 Monitor and troubleshoot shared resources and permissions.
	28.07 Implement remote-management tools and assist with updates and patches.
29.0	Demonstrate proficiency using network standards and protocols. The student will be able to:
	29.01 Describe the purpose of network standards (IEEE, IETF) and protocols (TCP/IP, DNS, DHCP, HTTP, FTP, SSH).
	29.02 Explain the OSI and TCP/IP models and map common protocols to each layer.
	29.03 Use network utilities (ping, tracert, ipconfig, nslookup, netstat) to verify connectivity.
30.0	Configure and troubleshoot hardware devices and drivers. The student will be able to:
	30.01 Install and configure hardware components (NICs, storage, peripherals).
	30.02 Update, roll back, or uninstall device drivers.
	30.03 Troubleshoot hardware resource conflicts and compatibility issues.
	30.04 Use diagnostic utilities to verify device functionality and firmware versions.
31.0	Monitor and optimize system performance and reliability. The student will be able to:
	31.01 Monitor CPU, memory, disk, and network usage using built-in tools (Task Manager, Resource Monitor, Performance Monitor).
	31.02 Manage startup processes and optimize system resources.
	31.03 Implement scheduled maintenance tasks (cleanups, updates, defragmentation).
	31.04 Perform system and user data backups and restores.
32.0	Manage and troubleshoot storage and user data. The student will be able to:

	32.01 Configure user profiles and local folder redirection.
	32.02 Partition and format drives; monitor and repair volumes using disk utilities.
	32.03 Configure disk quotas and data compression.
	32.04 Recover from disk errors and restore lost data using recovery tools.
33.0	Configure and troubleshoot network connections. The student will be able to:
	33.01 Install and configure network adapters and drivers.
	33.02 Configure IP addressing (IPv4 and IPv6), subnet masks, and gateways.
	33.03 Test and troubleshoot LAN and WLAN connections using appropriate tools.
	33.04 Configure VPN clients and remote access solutions.
	33.05 Identify and resolve common network protocol issues (DNS, DHCP, HTTP, SMB).
34.0	Implement and troubleshoot system and network security. The student will be able to:
	34.01 Apply operating-system security settings, local policies, and account management.
	34.02 Configure and troubleshoot file and folder permissions and encryption (EFS, BitLocker).
	34.03 Enable auditing and review security logs.
	34.04 Implement antivirus, firewall, and endpoint protection solutions.
	34.05 Apply principles of least privilege and password/MFA policies.
35.0	Demonstrate effective communication in technical environments. The student will be able to:
	35.01 Communicate technical information clearly to non-technical users in oral and written form.
	35.02 Document troubleshooting steps and solutions using industry-standard templates.
	35.03 Deliver informal presentations or training to colleagues on IT topics.
	35.04 Use professional tone and grammar in all correspondence (tickets, chat, email).
36.0	Apply critical thinking and problem-solving skills. The student will be able to:
	36.01 Use structured troubleshooting models (CompTIA A+ 6-step process) to diagnose issues.
	36.02 Collaborate with team members to resolve complex technical problems.
	36.03 Conduct research using technical documentation and vendor resources.
	36.04 Track and analyze patterns in recurring issues to develop preventive solutions.
37.0	Use information technology tools to enhance productivity and collaboration. The student will be able to:

	37.01 Utilize IT asset-management and ticketing systems to record and track incidents.
	37.02 Use office productivity applications (Google Workspace, Microsoft 365) for documentation and reporting.
	37.03 Leverage remote-support and collaboration tools (Teams, Zoom, Slack) to assist users and teams.
	37.04 Apply version-control and file-management best practices for shared projects.
38.0	Describe organizational roles and team dynamics in IT environments. The student will be able to:
	38.01 Explain the structure and function of IT departments within an organization.
	38.02 Describe cross-functional collaboration between help desk, network, and security teams.
	38.03 Discuss quality assurance and continuous improvement processes in IT support.
	38.04 Identify how global and cloud technologies impact modern IT operations.
39.0	Demonstrate professional ethics and legal responsibilities in IT support. The student will be able to:
	39.01 Apply ethical decision-making when handling confidential data and user information.
	39.02 Recognize and comply with organizational policies and relevant laws (HIPAA, FERPA, GDPR).
	39.03 Describe the long-term consequences of unethical or illegal behavior in technology fields.
	39.04 Demonstrate responsible use of digital resources and adherence to acceptable-use policies.
Course Number: CTS0054 Occupational Completion Point – D Cloud Analyst – 150 Hours	
40.0	Evaluate and analyze cloud principles used in cloud computing. The student will be able to:
	40.01 Describe the evolution of cloud computing.
	40.02 Compare and contrast drivers and limitations of cloud computing.
	40.03 Compare and contrast the four main deployment models for cloud computing, public, private, community, and hybrid.
	40.04 Describe the three main service models for cloud computing (SaaS, PaaS, and IaaS).
	40.05 Describe the role of the Internet and virtualization in cloud computing.
	40.06 Identify managed services in cloud computing.
41.0	Identify the components of cloud-based services. The student will be able to:
	41.01 Demonstrate proficiency in accessing web applications through web browser.
	41.02 Describe, identify and use thin clients to complete business tasks.
	41.03 Describe, identify and use thick clients to complete business tasks.

	41.04 Describe, identify and use mobile clients to complete business tasks.
	41.05 Explain application hosting.
	41.06 Describe multipurpose architecture.
42.0	Evaluate cloud-based services. The student will be able to:
	42.01 Perform calculations to identify the costs and savings of different cloud-based models for an organization.
	42.02 Compare and contrast cloud-based services used in industry.
	42.03 Identify the impacts to current and future staffing and operational needs.
	42.04 Evaluate performance of cloud-based solutions using performance indicators.
43.0	Use cloud-based services. The student will be able to:
	43.01 Compare and contrast outsourcing and cloud computing as alternatives for business.
	43.02 Identify and use cloud-based services to improve productivity.
	43.03 Describe the differences between capital expenditures (CapEx) and operational expenditures (OpEx).
	43.04 Compare and contrast cloud-based services for consumer and business.
	43.05 Use cloud-based services to perform collaboration online.
	43.06 Compare and contrast the user experience in a cloud-based service and a traditional business model.
44.0	Evaluate and analyze techniques and methods of cloud deployment. The student will be able to:
	44.01 Describe networking for cloud-based solutions.
	44.02 Describe the role of automation and self-service in regard to cloud-based solutions.
	44.03 Examine deployment and management of internal and external cloud services to complete business task.
	44.04 Articulate the role of standardization in cloud-based solutions.
	44.05 Express the impact of cloud systems on time to market.
	44.06 Examine the distribution over the Internet in cloud deployment.
45.0	Evaluate the risks of cloud-based systems. The student will be able to:
	45.01 Identify and evaluate compliance risks relating to software and vendors in cloud-based systems.
	45.02 Describe user privacy rights and privacy risks in cloud-based systems.
	45.03 Describe legal risks in cloud-based systems.
	45.04 Explain the role of vendors and dependencies in cloud-based solutions.

	45.05 Explain the risks of hardware independence.
	45.06 Identify the main aspects of identity management.
46.0	Demonstrate an awareness of cloud implementation. The student will be able to:
	46.01 Describe the use of a Virtual Private network access to Local Area Network.
	46.02 Describe the risk of connecting a local cloud network to the public Internet.
	46.03 Identify and describe the components of cloud environment.
	46.04 Describe networking topologies in cloud environment.
	46.05 Describe servers, switches, and routers in cloud-based architecture.
	46.06 Explain the role of the datacenter in cloud-based architecture.
Course Number: CTS0056 Occupational Completion Point – E Cloud Virtualization Specialist – 300 Hours	
47.0	Demonstrate an understanding of virtualization concepts. The student will be able to:
	47.01 Describe the role of the virtual CPU in virtualization.
	47.02 Describe the role of virtual memory in virtual component.
	47.03 Identify the process of system patching for virtual environment.
	47.04 Describe virtual desktops.
	47.05 Evaluate the components of networking topology including (servers, network, storage).
	47.06 Compare and contrast traditional desktops and servers to virtual counterpart.
	47.07 Analyze the hardware requirements to create and scale a virtual infrastructure.
	47.08 Compare and contrast traditional virtualization and para-virtualization.
	47.09 Identify, describe and use guest operating system in a virtualization environment.
	47.10 Identify, define and use virtual machine monitor in virtual environment.
	47.11 Perform virtual partitioning through the Hypervision.
	47.12 Describe bare metal approach for virtualization portioning.
	47.13 Describe hosted virtualization as a virtualization approach.
	47.14 Apply industry standards for hardware support for virtualization.
	47.15 Explain high-level language virtual machines.

	47.16 Describe the benefits of server consolidation and containment acquired through migration to virtualization.
	47.17 Describe the benefits of test and development optimization gained through virtualization.
	47.18 Demonstrate how virtualization reduces cost and complexity of high availability and disaster recovery.
	47.19 Demonstrate how virtualization can enhance security in the enterprise.
48.0	Install and configure the virtualization server platform. The student will be able to:
	48.01 Compare and contrast virtual image to a golden image.
	48.02 Create a virtual image using a virtualization platform using a base operating system.
	48.03 Create a virtual template in which the golden image is configured with the software packages and application.
	48.04 Configure the virtual template to ensure software settings and organizational polices are implemented.
	48.05 Manage inventory objects licenses using the virtual infrastructure to comply with enterprise requirements.
	48.06 Demonstrate how a virtual switch is used to create communication between virtual machines.
	48.07 Perform communication between two virtual machines through the use of a virtual switch.
	48.08 Create, manage and configure virtual switches to enable communication of virtual machines in different hosts.
	48.09 Use virtual system management to remotely manage the allocation in a virtual network.
	48.10 Perform and manage user roles and permission in a virtual environment.
	48.11 Perform server patching on a virtual environment both on traditional servers as well virtual servers.
49.0	Install, configure and manage virtualized clients. The student will be able to:
	49.01 Describe peripheral redirection.
	49.02 Demonstrate proficiency in configuring virtual client to enable both USB and monitor redirection.
	49.03 Compare and contrast the use of peripherals in a traditional and virtual environment.
	49.04 Classify the types of virtual clients used in a virtualization infrastructure.
	49.05 Demonstrate proficiency in performing tasks using thin, thick and mobile virtualization clients.
	49.06 Compare and contrast the performance, ease of use and efficiency of different clients in completing business tasks.
	49.07 Analyze business tasks that are better aligned to a particular virtualization client type.
	49.08 Demonstrate proficiency in managing user sessions and policies of virtual clients.
50.0	Demonstrate proficiency in managing a virtualization infrastructure. The student will be able to:
	50.01 Describe the process of cloning virtual machines.

	50.02	Identify the benefits of cloning in a virtual infrastructure.
	50.03	Compare and contrast full clones and linked clones.
	50.04	Demonstrate proficiency in identifying situations in which cloning is a proper solution.
	50.05	Demonstrate proficiency in deploying virtual machines using cloning.
	50.06	Describe virtual migration and the situational needs that are required.
	50.07	Identify the role of network bandwidth and resource allocation needed for virtual migration.
	50.08	Describe automating migration to the host server.
	50.09	Identify the process that migration affect virtual disk storage in particular SANS.
	50.10	Demonstrate proficiency in developing action steps to execute a virtual migration.
51.0	Demonstrate an understanding of storage technologies and storage configuration. The student will be able to:	
	51.01	Describe the evolution of storage architecture and data center components.
	51.02	Describe, identify and use data center elements host, connectivity and storage.
	51.03	Identify describe and use RAID technology in an enterprise environment.
	51.04	Identify the impact to application performance based on RAID implementation.
	51.05	Describe an intelligent storage system.
	51.06	Compare and contrast storage systems for a virtualization infrastructure.
	51.07	Compare and contrast various storage network technologies. (e.g., Fibre Channel Storage Network FC Scan, IP Scan, Fibre Channel over Ethernet, Network Attached Storage, Object Based, Unified Storage)
	51.08	Identify the appropriate storage network solutions based on client requirements.
	51.09	Demonstrate proficiency in creating and managing data stores.
	51.10	Demonstrate proficiency in configuring and managing resource pools.
52.0	Demonstrate proficiency in network optimization using network protocols, ports, and topologies. The student will be able to:	
	52.01	Describe disaster recovery (business continuity) information availability for virtualized and non-virtualized environments.
	52.02	Demonstrate proficiency in backup and recovery in both virtualized and non-virtualized environments.
	52.03	Explain deduplication technology for backup optimization.
	52.04	Identify fixed content storage requirements and archival solutions.
	52.05	Describe continuous data replication and remote replication in virtualized and non-virtualized environments.
	52.06	Demonstrate proficiency in integrating Active Directory to a virtual environment.

	52.07 Demonstrate proficiency in CPU and memory optimization.
	52.08 Demonstrate proficiency using remote desktops and display protocols to optimize network infrastructure.
	52.09 Describe fault tolerance and acceptable levels tolerated based on the infrastructure.
53.0	Understand security in a virtualized environment. The student will be able to:
	53.01 Compare and contrast hosted and Bare-Metal virtualization implementations vulnerability to threats and attacks.
	53.02 Identify data leakage and malicious code intrusion.
	53.03 Demonstrate proficiency in securing data between guest and host environments.
	53.04 Demonstrate proficiency in managing resource allocation in a virtualized environment to reduce system crash.
	53.05 Demonstrate proficiency in creating images that are secure for client deployment.
	53.06 Identify software security levels and digital signatures.
	53.07 Demonstrate proficiency in using, configuring and managing host firewall in a virtualized infrastructure.
	53.08 Demonstrate proficiency in using command line to configure and manage the host firewall.
	53.09 Demonstrate proficiency in using logging tools to monitor activity in the virtual environment.
	53.10 Identify, describe and provide solutions to threats based on scalability and high availability.
	53.11 Demonstrate proficiency in securing mobile, thin and thick clients.
	53.12 Explain threats to network authentication in a virtualized environment.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

This program is a replacement for Applied Cybersecurity Y100300 (0511100302).

Program Title: **Applied Cybersecurity**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y100500	
CIP Number	0511100316	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics) 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and cybersecurity-related careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of cybersecurity.

The content includes but is not limited to foundational knowledge and skills in computer and network security, security vulnerabilities, attack mechanisms and techniques, intrusion detection and prevention, cryptographic systems, system hardening, risk identification, incidence response, penetration testing, key management, access control, and recovery. Specialized courses focus on database security, planning and analysis, software, and web security.

Additional Information relevant to this Career and Technology (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points (OCPs). To complete this program, students must complete OCP A, OCP B, plus one of the subsequent courses OCP C.

This program is comprised of courses that have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

Course Sequence	OCP	Course Number	Course Title	Teacher Certification	Length
Course 1	A	CTS0010	Cybersecurity Foundations	BUS ED 1 @2 COMPU SCI 6 CYBER TECH 7G INFO TECH 7G	300 hours
Course 2	B	CTS0014	Applied Cyber Defense	BUS ED 1 @2 COMPU SCI 6 CYBER TECH 7G INFO TECH 7G	300 hours
Course 3 Options	C	CTS0019	Information Security Manager		150 hours
		CTS0021	Data Security Specialist		150 hours
		CTS0060	Software Security Specialist		150 hours
		CTS0085	Web Security Specialist		150 hours
		CTS0089	Information Security Administrator		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of computer systems.
02.0 Demonstrate knowledge of different operating systems.
03.0 Develop a familiarity with the information technology industry.
04.0 Develop an awareness of microprocessors and digital computers.
05.0 Develop an awareness of programming languages.
06.0 Develop an awareness of emerging technologies.
07.0 Demonstrate an understanding of the OSI and TCP/IP models.
08.0 Identify computer components and their functions.
09.0 Demonstrate proficiency using the Internet to locate information.
10.0 Demonstrate an understanding of Internet safety and ethics.
11.0 Demonstrate proficiency using word processing applications.
12.0 Perform email activities.
13.0 Demonstrate proficiency in using presentation software and equipment.
14.0 Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications.
15.0 Describe the national agencies and supporting initiatives involved in cybersecurity.
16.0 Demonstrate an understanding of virtualization technology.
17.0 Demonstrate an understanding of basic computer components, their functions, and their operation.
18.0 Demonstrate knowledge of different operating systems.
19.0 Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model.
20.0 Demonstrate proficiency using computer networks.
21.0 Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections.
22.0 Demonstrate an understanding of basic security concepts.
23.0 Demonstrate an understanding of legal, ethical, and regulatory issues in cybersecurity.
24.0 Discuss the underlying concepts of terms used in cybersecurity.
25.0 Recognize and understand the administration of the following types of remote access technologies.
26.0 Understand the application of the following concepts of physical security.
27.0 Securely configure and maintain the following types of devices.
28.0 Understand the societal and security challenges of emerging technologies.
29.0 Recognize and be able to differentiate and explain the following access control models.
30.0 Understand the security concerns for the following types of media.
31.0 Explain the following security topologies as they relate to cybersecurity.
32.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
33.0 Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges.
34.0 Demonstrate an understanding of common information and computer system security vulnerabilities.
35.0 Demonstrate an understanding of common cyber attack mechanisms, their consequences, and motivation for their use.
36.0 Be able to identify and explain the following different kinds of cryptographic algorithms.

37.0 Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity.
38.0 Understand how cryptography and digital signatures address the following security concepts.
39.0 Understand and be able to explain the following concepts of PKI (Public Key Infrastructure).
40.0 Demonstrate an understanding of certificates and their role in cybersecurity.
41.0 Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation.
42.0 Demonstrate an understanding of Intrusion Detection Systems (IDS).
43.0 Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
44.0 Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
45.0 Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques.
46.0 Demonstrate an understanding of firewalls and other means of intrusion prevention.
47.0 Demonstrate an understanding of vulnerabilities unique to virtual computing environments.
48.0 Demonstrate an understanding of social engineering and its implications to cybersecurity.
49.0 Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability.
50.0 Demonstrate an understanding of how to configure host systems to guard against cyber intrusion.
51.0 Demonstrate an understanding of authentication methods and strategies.
52.0 Demonstrate an understanding of methods and strategies for controlling access to computer networks.
53.0 Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured.
54.0 Demonstrate an understanding of the processes involved in hardening a computer system or network.
55.0 Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations.
56.0 Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization.
57.0 Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes.
58.0 Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase.
59.0 Demonstrate proficiency in cybersecurity risk mitigation planning.
60.0 Demonstrate proficiency in establishing a risk management framework.
61.0 Demonstrate proficiency in creating a corporate security policy.
62.0 Demonstrate proficiency in addressing process risks.
63.0 Demonstrate proficiency in addressing physical security risks.
64.0 Demonstrate proficiency in cybersecurity contingency planning.
65.0 Demonstrate proficiency in cybersecurity disaster recovery planning.
66.0 Demonstrate proficiency in cybersecurity business continuity planning.
67.0 Demonstrate proficiency in the essential elements of forensic analysis.
68.0 Demonstrate an understanding of database design, structure, and operation.
69.0 Demonstrate a fundamental understanding of Structured Query Language (SQL).
70.0 Demonstrate an understanding of database security policies.
71.0 Demonstrate an understanding of database access control, functions, methods, and verification.
72.0 Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures.
73.0 Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery.
74.0 Demonstrate an understanding of software design, structure, and operation.
75.0 Demonstrate a fundamental understanding of common software attack vectors.
76.0 Demonstrate an understanding input syntax validation.

77.0 Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code.
78.0 Demonstrate an understanding of the role of environment variables in the operation of software applications.
79.0 Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks.
80.0 Demonstrate an understanding of the primary security services used in Internet and intranet environments.
81.0 Demonstrate a fundamental understanding of the SSL protocol stack and its elements.
82.0 Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms.
83.0 Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates.
84.0 Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network.
85.0 Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains.
86.0 Complete a safety skills inventory.
87.0 Demonstrate acceptable project values.
88.0 Demonstrate the ability to detect and resolve system vulnerabilities.
89.0 Plan, organize, and carry out a penetration-testing plan.
90.0 Demonstrate proficiency in conducting forensic analysis.
91.0 Successfully work as a member of a team.
92.0 Manage time according to a plan.
93.0 Keep acceptable records of progress problems and solutions.
94.0 Manage resources.
95.0 Use tools, materials, and processes in an appropriate and safe manner.
96.0 Research content related to the project and document the results.
97.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
98.0 Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon.

Florida Department of Education
Student Performance Standards

Program Title: **Applied Cybersecurity**
Career Certificate Program Number: **Y100300**

Course Number: CTS0010 **Occupational Completion Point: A** **Cybersecurity Foundations – 300 Hours**	
01.0	Demonstrate knowledge, skill, and application of computer systems. The student will be able to:
01.01	Describe and use current and emerging computer technology and software to perform personal and business related tasks.
01.02	Describe the types of communications and networking systems used in workplace environments.
01.03	Locate and use software application reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals.
01.04	Troubleshoot problems with computer hardware peripherals.
01.05	Describe ethical, privacy, and security issues and problems associated with computers and information systems.
01.06	Configure computer systems to protect against various low-level attacks.
02.0	Demonstrate knowledge of different operating systems. The student will be able to:
02.01	Identify the most common computer operating systems.
02.02	Describe and use industry accepted file naming conventions, particularly in NTFS, ext4, FAT, and ReFS file systems.
02.03	Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save).
02.04	Demonstrate a working knowledge of standard file formats.
02.05	Compare and contrast various operating systems (e.g., Android iOS, Windows, Mac, Linux).
02.06	Compare and contrast open source and proprietary software.
02.07	Explain how system utilities are used to maintain computer performance.
02.08	Evaluate criteria for selecting an operating system.
02.09	Configure various operating systems from their default installations to a more secure state.
03.0	Develop a familiarity with the information technology industry. The student will be able to:
03.01	Explain how information technology impacts the operation and management of business and society.
03.02	Identify and describe the various ways of segmenting the IT industry (e.g., hardware vs. software, server vs. client, business vs. entertainment, stable vs. mobile).
03.03	Describe how digital technologies (social media) are changing both work and personal lifestyles.

	03.04 Demonstrate an understanding of configuring social media used for business to meet various business requirements.
	03.05 Demonstrate an awareness of how cloud-based infrastructure impacts the IT industry.
04.0	Develop an awareness of microprocessors and digital computers. The student will be able to:
	04.01 Explain the relationship between the software hierarchy (applications, operating systems, drivers, firmware, and microcode) as it relates to security.
	04.02 Explain the need for and use of peripherals and how they can compromise security.
	04.03 Demonstrate proficiency installing and using plug-and-play peripherals and explain their associated security risks.
	04.04 Identify the basic concepts of computer maintenance and upgrades and their relevance as it relates to security.
05.0	Develop an awareness of programming languages. The student will be able to:
	05.01 Compare the various types or classes of programming languages (e.g., compiled, interpretive).
	05.02 Differentiate between source code, machine code, interpreters, and compilers.
	05.03 Differentiate among different programming data types (integers, float, characters, strings, variables).
	05.04 Explain the differences between variables and arrays.
	05.05 Explain programming logic control (Loops, If / Else, While).
	05.06 Explain basic web development concepts (HTML, CSS, JavaScript).
	05.07 Demonstrate a basic HTML website.
06.0	Develop an awareness of emerging technologies. The student will be able to:
	06.01 Compare and contrast emerging technologies and describe how they impact the security of business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, vehicles, home networks, peer-to-peer, IoT, embedded systems, AI).
	06.02 Adhere to published best practices for protecting personal identifiable information when using the Internet.
	06.03 Identify trends related to the secure use of information technology in people's personal and professional lives.
	06.04 Characterize how the rapid pace of change in information technology impacts our society's ability to keep the appropriate level of security.
07.0	Demonstrate an understanding of the OSI and TCP/IP models. The student will be able to:
	07.01 Explain the interrelations of the seven layers of the Open Systems Interconnection (OSI) as it relates to hardware and software.
	07.02 Describe the purpose of the OSI model and each of its layers.
	07.03 Explain specific functions belonging to each OSI model layer.
	07.04 Understand how two network nodes communicate through the OSI model.

	07.05	Discuss the structure and purpose of data packets and frames.
	07.06	Describe the two types of addressing covered by the OSI model.
	07.07	Explain the interrelations of the five layers of the TCP/IP model as it relates to hardware and software.
	07.08	Describe the purpose of the TCP/IP model and each of its layers.
	07.09	Explain specific functions belonging to each TCP/IP model layer.
	07.10	Understand how two network nodes communicate through the TCP/IP model.
	07.11	Describe MAC addressing and IP addressing and how they are different.
08.0	Identify computer components and their functions. The student will be able to:	
	08.01	Identify the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	08.02	Use common computer and programming terminology.
09.0	Demonstrate proficiency using the Internet to locate information. The student will be able to:	
	09.01	Identify and describe web terminology.
	09.02	Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto) and their associated secure protocols (e.g. https, ftps, ssh).
	09.03	Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil).
	09.04	Demonstrate proficiency using search engines, including Boolean search strategies.
	09.05	Demonstrate proficiency using various secure web tools (e.g., downloading of files, transfer of files, SSH, PDF).
10.0	Demonstrate an understanding of Internet safety and ethics. The student will be able to:	
	10.01	Describe cyber-bullying and its impact on perpetrators and victims.
	10.02	Differentiate between viruses and malware, specifically their sources, ploys, and impact on personal privacy and computer operation, and ways to avoid infection.
	10.03	Describe risks associated with sexting, including related legal issues, social engineering aspects, prevention methods, and reporting of offenses.
	10.04	Describe the risks associated with online gaming and ways to reduce these risks.
	10.05	Describe the intellectual property rights, ethics and legalities of downloading music or videos from the Internet.
	10.06	Describe various risks associated with social networking sites and ways to reduce these risks.
	10.07	Describe the risks associated with various conferencing programs and ways to reduce these risks.
	10.08	Adhere to cyber safety practices with regard to conducting Internet searches, email, chat rooms, and other social network websites.
	10.09	Describe the risks associated with artificial intelligence.

11.0	Demonstrate proficiency using word processing applications. The student will be able to:
11.01	Compare and contrast the appropriate use of various software applications (e.g., word processing, web browser, email, presentation, database, scheduling, financial management, music).
11.02	Demonstrate proficiency in the use of various software applications (e.g., word processing, web browser, email, presentation, database, scheduling, financial management, music).
12.0	Perform email activities. The student will be able to:
12.01	Describe email capabilities and functions.
12.02	Identify components of an email message.
12.03	Identify the components of an email address.
12.04	Identify when to use different email options.
12.05	Attach a file to an email message.
12.06	Forward an email message.
12.07	Use an address book if an address book is available via the school's Outlook server for the student to use.
12.08	Reply to an email message.
12.09	Use the Internet to perform email activities.
12.10	Identify the appropriate use of email and demonstrate related email etiquette.
12.11	Identify patterns of Email Phishing.
12.12	Identify common problems associated with widespread use of email.
12.13	Create folders to organize email.
13.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
13.01	Produce a presentation that includes music, animation, and digital photography and present it using appropriate technology.
13.02	Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
13.03	Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation where individuals on the team function in specific production roles.
13.04	Create a self-running presentation with synchronized audio, convert presentation slides (e.g., PowerPoint) into streaming ASF files for use on the web.
13.05	Present slides using best practices (audience engagement, minimal text on slides, professional).
14.0	Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications. The student will be able to:
14.01	Define cybersecurity.

	14.02 Describe how information security evolved into cybersecurity and the impact of the Internet on the pace and nature of the evolution and explore the practical and financial applications of cybercrime.
	14.03 Describe the individual elements that comprise the CIA triad (i.e., Confidentiality, Integrity, Availability).
	14.04 Define and explain the various types of threat actors and the role each plays in cybersecurity eg: Gray Hat, Black Hat, White Hat, Red Hat.
	14.05 Describe various methodologies used by threat actors and the basis for their employment.
	14.06 Describe the individual elements of the AAA model (Authentication, Authorization and Accounting).
15.0	Describe the national agencies and supporting initiatives involved in cybersecurity. The student will be able to:
	15.01 Describe current trends in cyber-attacks and strategies for combating them using frameworks such as MITRE ATT&CK.
	15.02 Describe the legal implications of computer hacking and other forms of cyber-attacks.
	15.03 Understand the importance of the weekly bulletins distributed by Cybersecurity & Infrastructure Security Agency (CISA) and National Institute of Standards and Technology (NIST).
	15.04 Determine if any software or hardware on a given network has vulnerabilities outlined in the most recent CISA bulletin.
16.0	Demonstrate an understanding of virtualization technology. The student will be able to:
	16.01 Define virtual computing
	16.02 Explain the benefits of virtual computing.
	16.03 Differentiate between guest and host operating systems.
	16.04 Install desktop virtualization software.
	16.05 Describe the role of the hypervisor.
	16.06 Create and upgrade a virtual machine.
	16.07 Optimize the performance of a virtual machine.
	16.08 Preserve the state of a virtual machine.
	16.09 Clone, move and share virtual machines.
	16.10 Use basic (static) and dynamic virtual disks and disk drives.
	16.11 Configure a virtual network.
	16.12 Connect devices to a virtual machine.
	16.13 Enable security settings on a virtual machine.
	16.14 Differentiate between different types of hypervisors.
17.0	Demonstrate an understanding of basic computer components, their functions, and their operation. The student will be able to:

	17.01	Describe the internal components of a computer (e.g., power supply, hard drive, mother board, I/O cards/ports, cabling).
	17.02	Demonstrate and understanding of common computer and programming terminology.
	17.03	Explain the physical and logical architecture of a microcomputer system.
	17.04	Describe the file types used in the operation of a computer.
	17.05	Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management).
18.0	Demonstrate knowledge of different operating systems. The student will be able to:	
	18.01	Compare operating system file naming conventions.
	18.02	Describe the common elements that comprise the architecture of an operating system (e.g., shell, file manager, memory manager, device manager, network manager).
	18.03	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	18.04	Demonstrate a working knowledge of standard file formats.
	18.05	Describe the purpose of various operating systems (e.g., Windows, Mac, iOS, Android and Linux).
	18.06	Differentiate between different operating systems and applications.
	18.07	Explain the basics of boot sequences, methods and startup utilities.
	18.08	Compare and contrast open source and proprietary software.
	18.09	Describe common system utilities used in performing computer maintenance.
	18.10	Demonstrate an understanding of operating system command line interfaces (command prompt, terminal, powershell).
19.0	Describe the services and protocols that operate in the application, transport, network, and data link layers of the OSI Model. The student will be able to:	
	19.01	Describe the services and protocols used in the OSI Application Layer (i.e., DHCP, DNS, FTP, HTTP, SMTP, Telnet, IMAP).
	19.02	Describe the services and protocols used in the OSI Transport Layer (i.e., TCP, TLS/SSL, UDP).
	19.03	Describe the services and protocols used in the OSI Network Layer (i.e., IP, ICMP, IGMP, IPsec).
	19.04	Describe the services and protocols used in the OSI Data Link Layer (i.e., ARP, OSPF, L2TP, PPP).
20.0	Demonstrate proficiency using computer networks. The student will be able to:	
	20.01	Define networking and describe the purpose of a network.
	20.02	Describe the conceptual background of digital networks and cloud computing including terminology and basics.
	20.03	Describe various types of networks and the advantages and disadvantages of each (e.g. peer-to-peer, client/server, ROI).
	20.04	Describe the use, advantages, and disadvantages of various network media (e.g. coaxial, twisted pair, fiber optics).
	20.05	Describe the function of various network devices (e.g. hub, switched hub or switch, router, bridge, gateway, access points).

	20.06 Describe how network devices are identified (i.e., IP addressing).
	20.07 Explain the protocols commonly used in a network environment.
	20.08 Differentiate between public and private IP addresses.
	20.09 Describe the common ports and corresponding protocols used in a network.
	20.10 Describe the difference between the Internet and intranet.
	20.11 Compare and contrast IP Version 4 (IPv4) and IP Version 6 (IPv6).
	20.12 Compare and contrast the different methods for network connectivity (e.g. broadband, wireless, Bluetooth, cellular).
	20.13 Discuss the differences between Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Virtual Local Area Network (VLAN), and Virtual Private Network (VPN).
21.0	Describe and differentiate between serial, digital subscriber line (DSL), Metro Ethernet, and cable modem WAN connections. The student will be able to:
	21.01 Describe the various types of cloud computing (IaaS, PaaS, SaaS) and modes of delivery (Public, Private, Community, Hybrid).
	21.02 Describe practices that aid in protecting the Hybrid cloud model.
	21.03 Describe the challenges and solutions associated with securing embedded devices.
22.0	Demonstrate an understanding of basic security concepts. The student will be able to:
	22.01 Distinguish between vulnerability, threat, exploit, and risk.
	22.02 Discuss the different types of attacks (e.g., active, passive).
	22.03 Define security policy and explain its role in cybersecurity.
	22.04 Describe the basic methods of authentication (e.g., password, biometrics, smart cards, two-factor authentication, multifactor authentication).
	22.05 Describe the various forms of encryption methodologies (e.g., symmetric, asymmetric, block cipher, stream cipher).
	22.06 Describe hash functions and their role in authentication.
	22.07 Describe various method of access control used in computer security (e.g., policies, groups, Access Control List (ACL)).
	22.08 Understand the concept of malware (i.e., ransomware, worms, viruses, adware) and how attackers use it to steal sensitive or confidential information.
Course Number: CTS0014 Occupational Completion Point: B Applied Cyber Defense - 300 Hours	
23.0	Demonstrate an understanding of legal, ethical, and regulatory issues in cybersecurity. The student will be able to:
	23.01 Define cybercrime and discuss the challenges facing law enforcement.
	23.02 Identify the key legislative acts that impact cybersecurity.

	23.03	Describe the Federal and Florida criminal code related to computers and give examples of cybercrimes and penalties, particularly those involving inappropriate access.
	23.04	Discuss the concept of digital forensics and its place in cybercrime investigations and incident response.
	23.05	Distinguish among the Intellectual Property Rights of trademark, patent, and copyright.
	23.06	Explain digital rights management and the implications of the Digital Millennium Copyright Act (DMCA).
	23.07	Describe the implications of various social media on the safeguarding of personal or sensitive information.
	23.08	Describe various safeguards that can be employed to help ensure that sensitive or confidential information is not inadvertently divulged or obtained.
	23.09	Discuss the ethical and legal considerations around artificial intelligence (role in cybersecurity, potential biases, privacy concerns, impacts on intellectual property).
24.0	Discuss the underlying concepts of terms used in cybersecurity. The student will be able to:	
	24.01	Differentiate between cybersecurity, information assurance, and cyber risk.
	24.02	Define confidentiality and give examples of security breaches.
	24.03	Define integrity and give examples of security breaches.
	24.04	Define authenticity and give examples of security breaches.
	24.05	Define accountability (non-repudiation) and give examples of security breaches.
25.0	Recognize and understand the administration of the following types of remote access technologies. The student will be able to:	
	25.01	Configure 802.1x authentication for a given scenario.
	25.02	Connect clients to a VPN.
	25.03	Understand Authentication, Authorization and Accounting (AAA) management.
	25.04	Differentiate between TACACS+ (Terminal Access Controller Access Control System) and RADIUS.
	25.05	Differentiate between Layer 2 Tunneling Protocol (L2TP) and Point-to-Point Tunneling Protocol (PPTP) protocols as they apply to VPN options.
	25.06	Implement the use of SSH (Secure Shell).
	25.07	Implement the use of IPsec (Internet Protocol Security).
	25.08	Identify vulnerabilities associated with authentication.
	25.09	Demonstrate the use and purpose of Kerberos.
26.0	Understand the application of the following concepts of physical security. The student will be able to:	
	26.01	Configure access controls including biometric devices, keypads and security tokens.

	26.02	Recognize social engineering attempts.
	26.03	Evaluate environmental controls (e.g., EMI shielding, temperature, humidity and fire suppression).
	26.04	Develop a method of training users to recognize, report and avoid social engineering attempts.
	26.05	Identify components of physical security including: mantraps, motion detection, alarm systems, locks, video surveillance, and fences/barricades.
	26.06	Differentiate between CCTV, fixed, and PTZ cameras
	26.07	Recognize vulnerabilities associated with physical security.
	26.08	Explain how a mantrap is used as a counter measure against tailgating.
27.0	Securely configure and maintain the following types of devices. The student will be able to:	
	27.01	Configure and maintain software and hardware firewalls.
	27.02	Configure and secure routers.
	27.03	Apply security settings to switches.
	27.04	Configure and secure wireless devices.
	27.05	Secure a LAN connected to a DSL/cable modem.
	27.06	Configure a RAS (Remote Access Server) for remote connectivity.
	27.07	Explain the benefits of implementing a VPN (Virtual Private Network).
	27.08	Deploy IDS (intrusion detection system) and IPS (intrusion prevention systems).
	27.09	Analyze the performance, efficiency and security of the network based on network monitoring and diagnostic software.
	27.10	Employ techniques used to lock down workstations.
	27.11	Configure and secure servers for a given scenario.
	27.12	Understand and assess the security of mobile devices including but not limited to those using the Android, iOS and Windows platforms.
28.0	Understand the societal and security challenges of emerging technologies. The student will be able to:	
	28.01	Explain the security implications of the Internet of Things (IoT) (e.g., understand the efforts to address authentication and updates to IoT devices).
	28.02	Explain societal and security challenges associated with robotics.
	28.03	Explain security challenges associated with serverless computing.
	28.04	Explain societal and security challenges associated with the implementation of 5G.
	28.05	Describe and explain the security challenges of Autonomous vehicles (i.e., the significance of vehicular cybersecurity and its relation to: computer vision, artificial intelligence, machine learning and Deep learning.)

29.0	Recognize and be able to differentiate and explain the following access control models. The student will be able to:
	29.01 Understand access control as it applies to MAC (Mandatory Access Control).
	29.02 Understand access control as it applies to DAC (Discretionary Access Control).
	29.03 Understand access control as it applies to RBAC (Role Based Access Control).
30.0	Understand the security concerns for the following types of media. The student will be able to:
	30.01 Understand and identify security concerns with the use of Coaxial Cable.
	30.02 The student should be able to identify and understand security concerns for UTP/STP (Unshielded Twisted Pair / Shielded Twisted Pair).
	30.03 Identify and understand security concerns fiber optic cable.
	30.04 Identify security concerns associated with removable media.
	30.05 Address pitfalls associated with tape backups.
	30.06 Apply drive encryption to hard drives.
	30.07 Secure flash drives.
	30.08 Smartcards and secure USB memory.
31.0	Explain the following security topologies as they relate to cybersecurity. The student will be able to:
	31.01 Determine Security Zones.
	31.02 Point out vulnerabilities on a Screened Subnet (DMZ- Demilitarized Zone).
	31.03 Explain the security benefits of using an intranet.
	31.04 Explain the security benefits of using an extranet.
	31.05 Secure a VLAN (Virtual Local Area Network).
	31.06 Describe the security benefits associated with NAT (Network Address Translation).
	31.07 Justify the implementation of tunneling, for security purpose.
32.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	32.01 Describe the nature and types of business organizations.
	32.02 Explain the effect of key organizational systems on performance and quality.
	32.03 List and describe quality control systems and/or practices common to the workplace.
	32.04 Explain the impact of the global economy on business organizations.
	32.05 Display proficiency in using team-oriented collaboration and video teleconferencing software (e.g. Teams, Zoom).

33.0	Demonstrate an understanding of the technical underpinnings of cybersecurity and its taxonomy, terminology, and challenges. The student will be able to:
33.01	Explain the various elements that make up the security taxonomy used by the U.S. Computer Emergency Readiness Team (CERT).
33.02	Describe the challenges associated with achieving and maintaining computer security.
33.03	Discuss the range of potential consequences of various forms of security breaches.
33.04	Describe various defense mechanisms, techniques, and methodologies (e.g., antivirus, anti-malware, protocol analyzers and scans, analyzing email headers, patch management).
33.05	Compare and contrast mechanisms employed in passive and active cyber-attacks.
33.06	Describe vulnerabilities associated with each element of the CIA Triad.
33.07	Explain the differences between hardware, software, data, and network assets susceptible to cyber-attack.
33.08	Describe the tools and technologies used in cybersecurity.
33.09	Define intrusion detection and discuss its role in cybersecurity (e.g., HIDS and NIDS).
33.10	Explain what is meant by the term countermeasures (e.g., NIPS and HIPS).
33.11	Describe the role recovery plays in cybersecurity (e.g., Business Continuity Plan).
34.0	Demonstrate an understanding of common information and computer system security vulnerabilities. The student will be able to:
34.01	Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, organizational).
34.02	Describe the ways in which various social networks are cybersecurity targets.
34.03	Describe footprinting and explain how it is used to reveal system vulnerabilities.
34.04	Explain why default values and technical controls are points of vulnerability and describe the hardening efforts being taken by government and industry.
34.05	Describe the process of port scanning and explain why it is so prevalent in cybersecurity.
34.06	Describe what is meant by password strength and explain its relationship to vulnerability.
34.07	Distinguish between a weak and a strong password.
34.08	Describe some of the ways in which intruders can cover their tracks.
34.09	Describe the circumstances under which a computer system is vulnerable to a denial of service attack.
34.10	Demonstrate understanding of the term Common Vulnerabilities and Exposures (CVE).
34.11	Explain the importance of a CVSS score and how it obtained.
35.0	Demonstrate an understanding of common cyber-attack mechanisms, their consequences, and motivation for their use. The student will be able to:

	35.01 Describe spoofing as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.02 Describe the introduction of malware or spyware as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.03 Describe the use of grayware as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.04 Describe the use of computer viruses or worms as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.05 Describe Logic Bombs as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.06 Describe botnet and rootkit as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.07 Describe the introduction of a Trojan Horse as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.08 Describe DNS poisoning as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.09 Describe buffer overflow as an attack mechanism and discuss its consequences and common motivating factors for its use.
	35.10 Understand the risk associated with a zero-day exploit.
	35.11 Understand risks associated with P2P networking including the Gnutella protocol and Torrents.
	35.12 Describe the use of ransomware as an attack mechanism and discuss its consequences and common motivating factors for its use.
36.0	Be able to identify and explain the following different kinds of cryptographic algorithms. The student will be able to:
	36.01 Hashing Functions.
	36.02 Symmetric Keys.
	36.03 Asymmetric Keys.
37.0	Demonstrate an understanding of the following kinds of steganographic techniques and their use in cybersecurity. The student will be able to:
	37.01 Network steganographic methods (e.g., WLAN).
	37.02 Digital steganographic methods (e.g., image encryption, audio, mimic functions, video, packet manipulation).
	37.03 Understand how steganographic methods are used in malware.
38.0	Understand how cryptography and digital signatures address the following security concepts. The student will be able to:
	38.01 Confidentiality.
	38.02 Integrity.
	38.03 Authentication.
	38.04 Non-Repudiation.
	38.05 Access Control.

39.0	Understand and be able to explain the following concepts of PKI (Public Key Infrastructure). The student will be able to:
	39.01 Certificates (e.g., policies, practice statements).
	39.02 Revocation.
	39.03 Trust Models.
40.0	Demonstrate an understanding of certificates and their role in cybersecurity. The student will be able to:
	40.01 Describe the role of a Certificate Authority (CA).
	40.02 Describe Registration Authority (RA) and its relevance to security certificates.
	40.03 Compare and contrast SSL/TSL X.509-compliant certificates with PGP-compliant certificates.
	40.04 Describe the events that make up the lifecycle of a certificate.
	40.05 Describe how root certificate distribution works.
	40.06 Describe the role of a Certificate Revocation List (CRL).
	40.07 Describe the role of the Online Certificate Status Protocol (OCSP).
41.0	Demonstrate an understanding of intrusion, the types of intruders, their techniques, and their motivation. The student will be able to:
	41.01 Define intrusion.
	41.02 Describe the classes of intruders (i.e., masquerader, misfeasor, clandestine user).
	41.03 Describe what is meant by a hacker and discuss their role in cybersecurity.
	41.04 Compare and contrast the “black hat”, “white hat”, “blue hat”, and “grey hat” hacker cultures (i.e., computer criminal versus computer security expert).
	41.05 Describe various techniques used by hackers to achieve intrusion.
	41.06 Describe the difference between an inside and an outside attack.
42.0	Demonstrate an understanding of Intrusion Detection Systems (IDS) and their applications. The student will be able to:
	42.01 Describe the three logical components of an IDS (i.e., sensors, analyzers, and user interface), as well as the operation, typical activities, and outputs of an IDS.
	42.02 Explain how user behavior relates to the detection of an intruders and how this is incorporated into IDS applications.
	42.03 Describe the essential requirements for any IDS. 42.04 Differentiate between an intrusion detection system (passive) and an intrusion prevention system (reactive), highlighting their roles and responses in protecting systems. 42.05 Compare and contrast several intrusion detection systems available on the current market, evaluating their features, benefits, and limitations.
43.0	Describe host-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:

	43.01 Describe anomaly detection, specifically threshold and profile-based approaches.
	43.02 Describe the types of audit records employed in intrusion detection (i.e., native, detection-specific).
	43.03 Describe signature detection, specifically rule-based anomaly and penetration identification approaches.
44.0	Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature). The student will be able to:
	44.01 Describe the primary approach for intrusion detection in a network.
	44.02 Compare and contrast inline and passive sensors.
	44.03 Discuss typical placement of sensors in a network-based IDS environment and explain the rationale for each.
45.0	Demonstrate an understanding of port scanning and network traffic monitoring employed as intrusion detection techniques. The student will be able to:
	45.01 Describe the process of monitoring/detecting port scanning attacks and associated patterns.
	45.02 Explain how the monitoring and analysis of network traffic can be used to detect intrusion.
	45.03 Utilize network monitoring and analysis tools to detect intrusion and anomalies.
	45.04 Utilize a network scanner to identify online systems and open ports.
46.0	Demonstrate an understanding of firewalls and other means of intrusion prevention. The student will be able to:
	46.01 Describe the purpose and limitations of firewalls.
	46.02 Describe the four types of firewalls (i.e., packet filtering, stateful inspection, application-level gateway, circuit-level gateway).
	46.03 Describe the use of honeypots as an intrusion prevention technique.
	46.04 Explain how security policies are used to prevent intruders.
	46.05 Explain how Access Control Lists (ACLs) are used to prevent intrusion.
47.0	Demonstrate an understanding of vulnerabilities unique to virtual computing environments. The student will be able to:
	47.01 Describe the limitations of traffic monitoring within virtual networks.
	47.02 Discuss the primary vulnerability of virtual operating systems.
	47.03 Describe the “hypervisor” and explain its role in securing a virtual environment.
48.0	Demonstrate an understanding of social engineering and its implications to cybersecurity. The student will be able to:
	48.01 Define social engineering and describe its role in cybersecurity.
	48.02 Discuss common mechanisms that constitute social engineering (e.g., phishing, baiting, quid pro quo, pretexting).
	48.03 Describe the variety of attacks targeting the human element.
	48.04 Describe countermeasures that can be used to counter social engineering attacks.

	48.05 Describe the role or artificial intelligence as it relates to social engineering.
49.0	Demonstrate an understanding of fundamental security design principles and their role in limiting points of vulnerability. The student will be able to:
	49.01 Discuss the three over-arching security design principles (i.e., only necessary, simple, ease of use).
	49.02 Describe the principle of least privilege as it relates to computer security.
	49.03 Describe the principle of separation of duties as it relates to computer security.
	49.04 Describe the principle of defense in depth as it relates to computer security.
	49.05 Describe the principle of fail secure or fail safe and false positive or false negative as it relates to computer security.
	49.06 Describe the principle of complete mediation as it relates to computer security.
	49.07 Describe the principle of open design as it relates to computer security.
	49.08 Describe the principle of least common mechanism as it relates to computer security.
	49.09 The principle of psychological acceptability as it relates to computer security.
	49.10 Describe the principle of leveraging existing components as it relates to computer security.
	49.11 Describe the principle of weakest link as it relates to computer security.
	49.12 Describe the principle of single point of failure as it relates to computer security.
50.0	Demonstrate an understanding of how to configure host systems to guard against cyber intrusion. The student will be able to:
	50.01 Describe the security features and options available for configuring network routers to prevent intrusion.
	50.02 Describe the various types of firewalls (i.e., packet filtering, stateful, application-level gateway, circuit-level gateway) and how each can be used to prevent intrusion.
	50.03 Explain the configuration and operation of a Screened Subnet (DMZ) host, including the key services contained within the zone.
	50.04 Describe the role of security zones, content filters, subnets, and trusted zones in configuring a network infrastructure.
51.0	Demonstrate an understanding of authentication methods and strategies. The student will be able to:
	51.01 Describe the strengths, vulnerabilities, and countermeasures related to the use of passwords for authentication.
	51.02 Describe ways in which passwords are compromised and techniques/models for strengthening.
	51.03 Explain token authentication methods (e.g., memory cards, smart cards) and limitations.
52.0	Demonstrate an understanding of methods and strategies for controlling access to computer networks. The student will be able to:
	52.01 Compare and contrast the primary categories of access control (i.e., ABAC, discretionary, mandatory, role-based).
	52.02 Describe the underlying principles of authorization as an access control mechanism applicable to individuals, system services, subjects, objects.

	52.03	Discuss the key features of an access control system (i.e., reliable input, granularity, least privilege, separation of duty, open/close policies, conflict resolution, administration).
	52.04	Describe the three elements of access control (i.e., subject, object, rights).
	52.05	Describe access rights (i.e., read, write, execute, delete, create, search) and their use in establishing individual and group access control policies.
	52.06	Compare and contrast the use, operation, and limitations of Access Control Matrix (ACM), Access Control Lists (ACLs), and Capability Tickets in a network environment.
	52.07	Describe the UNIX file access control schema.
	52.08	Explain the relationship between security policies and access control.
	52.09	Describe the use, strengths, and vulnerabilities of group policies in access control and strategies for ensuring safety.
	52.10	Describe the key entities, relationships, and functions that comprise Role-Based Access Control (RBAC), including privilege management considerations.
53.0	Demonstrate an understanding of key network services, their operation, vulnerabilities, and ways in which they may be secured. The student will be able to:	
	53.01	Describe the operation of Dynamic Host Configuration Protocol (DHCP), its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	53.02	Describe the operation of the Domain Name System (DNS) service, its role in a network environment, its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	53.03	Describe the operation of the Simple Mail Transport Protocol (SMTP), its role in a network environment, its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	53.04	Describe the operation of the File Transfer Protocol (FTP) and Telnet, their role in a network environment, their vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
	53.05	Describe the operation of Hyper Text Transfer Protocol (HTTP / HTTPS), its vulnerabilities, typical cyber-attacks, and potential countermeasure strategies.
54.0	Demonstrate an understanding of the processes involved in hardening a computer system or network. The student will be able to:	
	54.01	Describe hardening and some of the general approaches for securing a computer network.
	54.02	Describe and apply the process by which a web server is hardened against their typical cyber-attacks.
	54.03	Describe and apply the process by which a mail server is hardened against their typical cyber-attacks.
	54.04	Describe and apply the process by which a FTP server is hardened against their typical cyber-attacks.
	54.05	Describe and apply the process by which a file/print server is hardened against their typical cyber-attacks.
	54.06	Describe and apply the process by which data repositories are hardened against their typical cyber-attacks.
	54.07	Describe and apply the process by which Directory Services is hardened against their typical cyber-attacks.
	54.08	Describe and apply the process by which various network appliances are hardened against their typical cyber-attacks.

	54.09 Describe the purpose of hardened systems like a bastion host and jump server.
55.0	Demonstrate an understanding of Public Key Infrastructure (PKI) management functions, key states, and life cycle/transition considerations. The student will be able to:
	55.01 Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.
	55.02 Describe key escrow, its role in key management, its advantages, and its risks.
	55.03 Differentiate between key backup and key escrow.
	55.04 Explain the role of a key's expiration date, its implications on the key's validity, and its relationship to deactivation.
	55.05 Describe the circumstances under which a key might be revoked, who has authority to revoke a key, and how revocation is communicated.
	55.06 Compare and contrast key suspension and key revocation.
	55.07 Describe ways in which key recovery might be achieved, who is authorized to recover keys, and associated vulnerabilities to attack.
	55.08 Compare and contrast key renewal and key replacement, who is authorized to initiate renewal or replacement, and associated vulnerabilities to attack.
	55.09 Describe the circumstances under which a key might be destroyed, the considerations prior to destruction, and associated vulnerabilities to compromise or attack.
56.0	Demonstrate an understanding of the processes associated with assessing vulnerabilities and risks within an organization. The student will be able to:
	56.01 Describe the process of asset identification relative to risk assessment and the considerations or criteria used in identifying assets requiring protection and understand how to leverage a configuration management database (CMDB) for asset management.
	56.02 Describe the process of threat identification, including identifying the types of threats, asset vulnerabilities, and threat sources.
	56.03 Describe the process of risk assessment, including determination of attack probability, attack consequences, and assignment of risk priorities.
	56.04 Evaluate an existing security posture and identify gaps and vulnerabilities in security.
	56.05 Describe the role of governance, risk, and compliance in achieving a more secure organization.
	56.06 Describe the concepts of Key Performance Indicators and Risk Measurement. (e.g., annualized loss expectancy (ALE), annual rate of occurrence (ARO), single loss expectancy (SLE), Exposure Factor (EF).)
	56.07 Analyze and apply data and measurements to solve business problems and relate it to IT risk and business continuity.
57.0	Demonstrate an understanding of penetration testing, the types of tests and metrics, testing methodologies, and reporting processes. The student will be able to:
	57.01 Describe the types of penetration tests (i.e., human, physical, wireless, data networks, telecommunications), the goals of each type, the metrics tested, and the value of their results.
	57.02 Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
	57.03 Define attack vector and explain its relationship and importance to penetration testing.

	57.04	Describe common testing methodologies and standards used in penetration testing.
	57.05	Describe the salient points, structure, detail, and documentation typically addressed in reporting and debriefing the results of penetration testing.
	57.06	Detect malicious and abnormal activities through logs, intrusion detection systems, and other utilities and appliances.
	57.07	Reproduce methods that intruders use to gain unauthorized access to a network system for purposes of compromising information assets.
	57.08	Deploy proprietary and/or open source tools to test known technical vulnerabilities in networked systems.
	57.09	Determine which vulnerabilities are exploitable and estimate the risk and impact of potential exploitations.
	57.10	Recommend appropriate mitigation procedures against discovered vulnerabilities and security gaps.
	57.11	Model the ethics of a licensed Penetration Tester or Computer Security Specialist.
58.0	Demonstrate an understanding of the Incident Response Life Cycle and the activities comprising each phase. The student will be able to:	
	58.01	Describe the activities that make up the Preparation Phase of the Incident Response Life Cycle (e.g., identification of useful tools and resources, setting up a war room, securing communications, creating a governance team, identifying key stakeholders for response activities.)
	58.02	Describe the activities that make up the Detection and Analysis Phase of the Incident Response Life Cycle, including identification of indication sources, analysis of resulting signs of an intrusion event, documentation and notification of the incident.
	58.03	Describe the factors to consider when prioritizing an incident.
	58.04	Describe the activities that make up the Containment, Eradication, and Recovery Phase of the Incident Response Life Cycle, including selecting a containment strategy, collecting and preserving evidence for forensic analysis, identifying the attacker, re-securing the system and system restoration.
	58.05	Describe the activities that make up the Post Incident Activity Phase of the Incident Response Life Cycle, including identification of lessons learned and evidence retention.

Course Number: CTS0019 **Occupational Completion Point: C** **Information Security Manager – 150 Hours**	
59.0	Demonstrate proficiency in cybersecurity risk mitigation planning. The student will be able to:
59.01	Describe the major activities and security controls that are implemented as part of a sound risk management program.
59.02	Discuss the rationale for executive sponsorship and delineated management responsibilities in successfully implementing a risk management program.
60.0	Demonstrate proficiency in establishing a risk management framework. The student will be able to:
60.01	Describe the importance of creating a system definition for use in assessing vulnerabilities and risks.
60.02	Describe the major elements of a system definition.

	60.03	Differentiate among critical assets, cyber assets, and critical cyber assets.
	60.04	Explain why cyber assets are classified as public, restricted, confidential, or private and why this plays a role in creating a risk management framework.
	60.05	Compare and contrast the classes of cyber assets (i.e., public, restricted, confidential, private) and give examples of each.
	60.06	Create a system definition that identifies all cyber assets, their class, and their risk category (e.g., critical).
	60.07	Describe an Electronic Security Perimeter (ESP) and discuss its role in formulating a risk management framework.
	60.08	Describe the process and goals of a vulnerability assessment of ESP access points.
	60.09	Define risk level and explain the variabilities of its components.
	60.10	Describe ways in which system vulnerability may be ranked according to impact (e.g., safety, outage, privacy, monetary).
	60.11	Describe some of the security controls (e.g., access control, training, audit, configuration, maintenance) that come into play when determining the appropriate risk mitigation strategy.
	60.12	Compare and contrast a top-down and a bottoms-up analysis approach for identifying and mitigating risks.
	60.13	Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
	60.14	Create a risk management framework.
61.0	Demonstrate proficiency in creating a corporate security policy. The student will be able to:	
	61.01	Describe the best practices and security controls that typify a sound corporate security policy.
	61.02	Discuss the elements of a corporate security policy, including policy management, personnel and training, critical asset management, ESP, physical security, incident reporting and response, disaster recovery and business continuity plans.
	61.03	Describe the need for specific implementation and enforcement processes as part of a corporate security policy.
	61.04	Explain the controls required for addressing personnel risks in a corporate security policy (e.g., training, hiring due diligence, enforcement of “least privilege,” access revocation).
62.0	Demonstrate proficiency in addressing process risks. The student will be able to:	
	62.01	Describe the best practices and security controls typically implemented for assessing and mitigating operational risks, including:
	•	Conduct periodic posture risk assessments.
	•	Enforce access control, monitoring, and logging.
	•	Perform disposal/redeployment of assets.
	•	Enforce change control and configuration management.
	•	Conduct vulnerability assessments.
	•	Control, Monitor, and log all access to assets.
	•	Configuration and maintenance.

	• Ensure incident-handling processes.
	• Provide for contingency planning.
62.02	Create an organized mitigation table that identifies operational or process risks, the potential impact of the risk, and specific actions required to mitigate the risk.
63.0	Demonstrate proficiency in addressing physical security risks. The student will be able to:
63.01	Describe the best practices and security controls that ensure good physical security of critical infrastructure and assets.
63.02	Discuss the resulting potential for compromise once physical security is breached.
63.03	Create an organized mitigation table that identifies physical security risks, the potential impact of the risk, and specific actions required to mitigate the risk.
64.0	Demonstrate proficiency in cybersecurity contingency planning. The student will be able to:
64.01	Define resiliency and its relationship to contingency planning.
64.02	Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
64.03	Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, and Appendices).
64.04	Describe the contingency planning process and the rationale for each step in the process.
64.05	Explain the three step process for conducting a business impact analysis (i.e., determine recovery criticality, identify resource requirements, identify recovery priorities).
64.06	Compare and contrast Maximum Tolerable Downtime (MTD), Recovery Time Objective (RTO), and Recovery Point Objective (RPO).
64.07	Discuss the criteria typically used to activate the contingency plan.
64.08	Discuss the role of backup and recovery considerations in contingency planning.
64.09	Create a contingency plan that includes roles and responsibilities, a business impact analysis with contingency strategies/solutions, outage assessment, resource recovery priorities, backup and recovery strategies, and testing/training considerations.
65.0	Demonstrate proficiency in cybersecurity disaster recovery planning. The student will be able to:
65.01	Describe the purpose and scope of a cybersecurity disaster recovery plan.
65.02	Describe various recovery strategies according to their appropriateness.
65.03	Explain the key considerations when formalizing a disaster recovery plan.
65.04	Discuss the role of data collection relative to disaster recovery.
65.05	Identify the types, purposes, and role of documentation during disaster recovery.
65.06	Discuss the role of testing in a disaster recovery plan.
66.0	Demonstrate proficiency in cybersecurity business continuity planning. The student will be able to:

	66.01	Describe the purpose and scope of a cybersecurity business continuity plan.
	66.02	Explain the concept of fault tolerance and discuss its role in business continuity planning.
	66.03	Identify and use various utilities employed for the purpose of business continuity.
	66.04	Describe the role of backups for ensuring business continuity.
67.0		Demonstrate proficiency in the essential elements of forensic analysis. The student will be able to:
	67.01	Describe the four phases of forensic analysis and discuss the activities performed in each phase.
	67.02	Describe the forensic and evidentiary considerations when determining containment.
	67.03	Describe the types and sources of data collected for forensic analysis.
	67.04	Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
	67.05	Explain the processes by which data is collected for analysis.
	67.06	Describe the role of system event logs in data collection.
	67.07	Describe the role of the process log in data collection.
	67.08	Describe the processes associated with preserving evidence collected for forensic purposes.
	67.09	Describe how the chain of custody can be maintained for evidence collected during a forensic analysis effort.
Course Number: CTS0021 **Occupational Completion Point: C** **Data Security Specialist – 150 Hours**		
68.0		Demonstrate an understanding of database design, structure, and operation. The student will be able to:
	68.01	Describe a relational database and its key elements.
	68.02	Describe the Entity Relationship Model (ERM) and relate how it is a factor in database security.
	68.03	Describe the process of normalization and explain its role in database security.
	68.04	Differentiate between one-to-many, many-to-many and one-to-one relationships.
	68.05	Define referential integrity and describe its implications on database security.
	68.06	Discuss the role of authentication in database security.
69.0		Demonstrate a fundamental understanding of Structured Query Language (SQL). The student will be able to:
	69.01	List the capabilities of SQL SELECT statements.
	69.02	Execute basic SQL statements, including SELECT, INSERT, and UPDATE.
	69.03	Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.

	69.04	Use column aliases to rename columns in the query result.
	69.05	Use SQL to display the structure of a table.
	69.06	Apply SQL syntax to restrict the rows returned from a query.
	69.07	Demonstrate application of the WHERE clause syntax.
	69.08	Apply the proper comparison operator to return a desired result.
	69.09	Create, drop, rename and truncate tables using SQL.
	69.10	Create and remove an index using a SQL statement.
	69.11	Create or modify users and roles using SQL statements.
	69.12	Use the GRANT and REVOKE SQL statements to control access.
	69.13	Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML) SQL statements and discuss their respective implications to database security.
70.0	Demonstrate an understanding of database security policies. The student will be able to:	
	70.01	Explain the role of the Database Management System (DBMS) in maintaining database security.
	70.02	Describe three aspects of system level security related to databases (i.e., user privilege schema, user authentication, operating system level privileges).
	70.03	Describe the mechanisms that control access to and use of the database at the object level.
	70.04	Explain how role-based privilege assignment can be used as a data security model.
	70.05	Compare and contrast the implications of connecting to a database with administrator versus user privileges.
71.0	Demonstrate an understanding of database access control, functions, methods, and verification. The student will be able to:	
	71.01	Compare and contrast rights and privileges as they relate to database security.
	71.02	Describe the manner in which database user rights and privileges are controlled (e.g., granted, revoked).
	71.03	Describe application access rights and discuss their role in a database security schema.
	71.04	Compare and contrast table, column, and row level security, including VIEW implications.
	71.05	Describe fine-grained access control and its use in database security.
	71.06	Describe the operation of a database firewall and explain its role in a database security schema.
	71.07	Describe how database security policies may be used to trigger security auditing events.
	71.08	Describe the various types of auditing (e.g., statement, privilege, object, fine-grained) and associated records.
72.0	Demonstrate an understanding of database vulnerabilities, attack vectors, and associated countermeasures. The student will be able to:	
	72.01	Describe the SQL Injection attack vector and explain its potential consequences (e.g., privilege escalation, data compromise, data

		destruction).
	72.02	Describe database inference as a vulnerability and explain how sensitive information can be compromised inadvertently.
	72.03	Discuss ways in which to prevent or limit database inference at design time and query time.
	72.04	Compare and contrast the various countermeasures and strategies to prevent an SQL injection from being successful.
	72.05	Compare and contrast the ways in which encryption might be applied to a database (i.e., database, fields, records, columns) and discuss the tradeoffs of each.
73.0		Demonstrate an understanding of pre- and post-intrusion actions to facilitate database recovery. The student will be able to:
	73.01	Describe the criteria that might be employed to trigger an intrusion or breach alarm.
	73.02	Identify the sources for confirming and tracking intrusion.
	73.03	Describe the tools and methodologies used to determine the scope of data compromise.
	73.04	Assess an intrusion, determine the scope of compromise, and restore compromised data.
	73.05	Describe the appropriate actions related to database recovery during incidence response.
Course Number: CTS0060 **Occupational Completion Point: C** **Software Security Specialist – 150 Hours**		
74.0		Demonstrate an understanding of software design, structure, and operation. The student will be able to:
	74.01	Describe a typical software application and its key elements.
	74.02	Compare and contrast software quality and software security in terms of development time, testing, and implementation.
	74.03	Explain how security can be a software design parameter and discuss the inherent trade-offs during the development life cycle.
	74.04	Describe the common failings in software security (e.g., input handling, inadequate testing, incomplete/incorrect algorithms, memory misuse, holes for privilege escalation).
75.0		Demonstrate a fundamental understanding of common software attack vectors. The student will be able to:
	75.01	Describe how buffer overflow attacks can be prevented through input validation and proper interpretation.
	75.02	Describe a command injection attack, how it can occur, and the potential consequences.
	75.03	Describe an SQL injection attack, how it can occur, and the potential consequences.
	75.04	Describe a code injection attack, including PHP remote code injection, how it can occur, and the potential consequences.
	75.05	Describe cross-site scripting attack, how it can occur, and the potential consequences.
76.0		Demonstrate an understanding input syntax validation. The student will be able to:

	76.01 Explain the need for validating input syntax to ensure proper input handling.
	76.02 Describe canonicalization and its role in handling alternate encoding schemas.
	76.03 Discuss the risks associated with improper handling of signed or unsigned numeric input (e.g., very large data length versus negative number; the current list of OWASP top 10 vulnerabilities
77.0	Demonstrate an understanding of best practices for processing input data to ensure safe and secure program code. The student will be able to:
	77.01 Explain why any input processing algorithm must correctly handle all problem variants.
	77.02 Explain why debug or test code should be removed from all production bound software.
	77.03 Describe the need for ensuring that machine instructions correctly implement the intended actions of the high-level language code.
	77.04 Describe the concept of a strongly typed programming language and explain its role in correct data interpretation.
	77.05 Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).
	77.06 Describe the race condition associated with shared memory access, its causes, and potential consequences (e.g., DOS attack causing deadlock).
78.0	Demonstrate an understanding of the role of environment variables in the operation of software applications. The student will be able to:
	78.01 Describe how the PATH, IFS, and LD_LIBRARY_PATH environment variables can be exploited.
	78.02 Explain how dynamic libraries can be subverted through the use of environment variables and describe the potential consequences (e.g., elevated privileges).
	78.03 Describe the principle of “least privilege” relative to the operation of software applications, particularly as it relates to file/directory ownership management.
79.0	Demonstrate an understanding of program design strategies for inhibiting elevated privilege attacks. The student will be able to:
	79.01 Describe a Root/Admin program and explain the development and operational benefits of partitioning the program into smaller modules.
	79.02 Identify the sources for confirming and tracking intrusion.
	79.03 Describe the tools and methodologies used to determine the scope of data compromise.
	79.04 Assess an intrusion, determine the scope of compromise, and restore compromised data.
	79.05 Describe the appropriate actions related to database recovery during incidence response.
Course Number: CTS0085 Occupational Completion Point: C Web Security Specialist – 150 Hours	
80.0	Demonstrate an understanding of the primary security services used in Internet and intranet environments. The student will be able to:
	80.01 Describe Secure Sockets Layer (SSL) security service.

	80.02	Compare and contrast SSL with Transport Layer Security (TLS) as a security service.
	80.03	Describe Internet Protocol Security (IPsec) and discuss its benefits and three functional areas (i.e., authentication, confidentiality, key management).
	80.04	Describe Secure/Multipurpose Internet Mail Extension (S/MIME) and discuss its role in achieving secure Internet-based communications.
81.0	Demonstrate a fundamental understanding of the SSL protocol stack and its elements. The student will be able to:	
	81.01	Compare and contrast SSL Connection and SSL Session.
	81.02	Describe SSL Record Protocol services and discuss their role in managing SSL exchanges (i.e., message integrity, confidentiality).
	81.03	Describe the operation of the SSL Record Protocol, including the key steps that ensure security (e.g., adding message authentication code, encryption).
	81.04	Explain the role of the SSL Change Cipher Spec Protocol in ensuring secure transactions.
	81.05	Explain the role of the SSL Alert Protocol.
	81.06	Describe the SSL Handshake Protocol and explain the role of each phase of communication (i.e., establish security capability, server authentication/key exchange, client authentication/key exchange, complete secure connection).
82.0	Demonstrate an understanding of IPsec, including its uses, elements, and mechanisms. The student will be able to:	
	82.01	Compare and contrast IPsec with SSL and TSL.
	82.02	Compare and contrast security services provided under IPv4 and IPv6.
	82.03	Differentiate between the three facilities available under IPsec (i.e., Authentication Header, Encapsulating Security Payload, key exchange).
	82.04	Describe the concept of Security Association (SA) and explain the roles of its three parameters (i.e., Security Parameters Index, IP Destination Address, Security Protocol Identifier).
	82.05	Describe the purpose, structure, and criteria of the Authentication Header (AH).
	82.06	Describe the purpose, structure, and elements of the Encapsulating Security Protocol (ESP).
	82.07	Describe the structure and operation of the key management facility of IPsec.
83.0	Demonstrate an understanding of S/MIME, including its uses, functions, cryptographic algorithms, and key certificates. The student will be able to:	
	83.01	Describe the role of S/MIME in conducting email communications.
	83.02	Compare and contrast the four new security functions provided by S/MIME (i.e., enveloped data, signed data, clear-signed data, signed and enveloped data).
	83.03	Outline the process of using S/MIME during email processing.
	83.04	Describe the various cryptographic algorithms used by S/MIME and discuss their applicability (i.e., DSS, RSA, SHA-1, MD5, ElGamal, AES, 3DES, HMAC).
	83.05	Describe memory leak as it pertains to dynamically allocated memory, its causes, and potential consequences (e.g., DOS attack).

	83.06 Describe the need for using x.509 v3 public key certificates with S/MIME.
84.0	Demonstrate an understanding of Kerberos and its role in third-party authentication in a distributed network. The student will be able to:
	84.01 Compare and contrast the roles and operation of a Kerberos Authentication Server (AS) and a Ticket Granting Server (TGS).
	84.02 Describe a Kerberos realm and the mechanism for inter-realm authentication.
85.0	Demonstrate an understanding of identity management and ways in which secure identify information is exchanged across different domains. The student will be able to:
	85.01 Describe the key components of identity management architecture.
	85.02 Describe the concept of identity federation and explain its benefits.
	85.03 Describe the standards used in federated identity management (i.e., XML, SOAP, WS-Security, SAML).
Course Number: CTS0089 Occupational Completion Point: C Information Security Administrator – 150 Hours	
86.0	Complete a safety skills inventory. The student will be able to:
	86.01 Practice safety procedures while enrolled in this course.
	86.02 Demonstrate an understanding of safety and general policies and procedures.
87.0	Demonstrate acceptable project values. The student will be able to:
	87.01 Maintain a positive relationship with peers.
	87.02 Demonstrate adaptive self-management skills.
	87.03 Adhere to industry accepted, legal, and ethical standards of cyber conduct.
	87.04 Rotate through a wide variety of increasingly responsible experiences.
	87.05 Apply superior skills in communications, mathematics, and science appropriate to technological content and learning activities.
88.0	Demonstrate the ability to detect and resolve system vulnerabilities. The student will be able to:
	88.01 Prepare a vulnerability matrix to identify and record weak points, the type of vulnerability, significance of the vulnerability, the priority, and the solution.
	88.02 Determine possible solutions for each vulnerability.
	88.03 Research each detected vulnerability. 88.04 Describe federated authentication and authorization and its benefits.
	88.05 Document solutions as they are devised.
	88.06 Prepare an alternative for any solution that is not successful.

	88.07 Continue the process until a workable solution is found for each vulnerability.
89.0	Plan, organize, and carry out a penetration-testing plan. The student will be able to:
	89.01 Determine the scope and attack vectors for the test.
	89.02 Organize the team according to individual strengths.
	89.03 Assign specific tasks within a team.
	89.04 Prioritize the attack vectors and sequence the test.
	89.05 Identify required resources.
	89.06 Carry out the testing plan to successful completion.
	89.07 Create the test report detailing the goals, tests, findings, and results.
90.0	Demonstrate proficiency in conducting forensic analysis. The student will be able to:
	90.01 Create security incident handling and response policies.
	90.02 Recover deleted, encrypted, or damaged file information as evidence for prosecution in computer crimes.
	90.03 Deploy proprietary and/or open source tools to identify intruder footprints.
	90.04 Coordinate incident response activities.
	90.05 Prepare proper documentation of chain of custody, including accounting for evidence source, destination, and possession.
	90.06 Preserve forensic integrity of evidence.
	90.07 Model highest moral and ethical standards in conducting digital forensic investigations.
91.0	Successfully work as a member of a team. The student will be able to:
	91.01 Accept responsibility for specific tasks in a given situation.
	91.02 Document progress, and provide feedback on work accomplished in a timely manner.
	91.03 Complete assigned tasks in a timely and professional manner.
	91.04 Reassign responsibilities when the need arises.
	91.05 Complete daily tasks as assigned on one’s own initiative.
92.0	Manage time according to a plan. The student will be able to:
	92.01 Set realistic time frames and schedules.
	92.02 Record time worked in the daily journal.
	92.03 Meet goals and objectives set by the team.

	92.04 Identify individual priorities.
	92.05 Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.
93.0	Keep acceptable records of progress problems and solutions. The student will be able to:
	93.01 Develop a record keeping system in the form of a logbook or journal to record daily progress.
	93.02 Use a project journal to identify problem statement.
	93.03 Develop a portfolio of work accomplished to include design drawings, research, drawings and plans, storyboards, models, mock-ups and prototypes.
94.0	Manage resources. The student will be able to:
	94.01 Identify required resources for each stage of the project plan.
	94.02 Determine the methods needed to acquire needed resources.
	94.03 Demonstrate good judgment in the use of resources.
	94.04 Recycle and reuse resources where appropriate.
	94.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
95.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	95.01 Identify the proper tool for a given job.
	95.02 Use tools and machines in a safe manner.
	95.03 Adhere to laboratory or job site safety rules and procedures.
	95.04 Identify the application of processes appropriate to the task at hand.
	95.05 Identify materials appropriate to their application.
96.0	Research content related to the project and document the results. The student will be able to:
	96.01 Identify the basic research needed to develop the project plan.
	96.02 Identify available resources for completing background research required in the project plan.
	96.03 Demonstrate the ability to locate resource materials in a library, database, internet and other research resources.
	96.04 Demonstrate the ability to organize information retrieval.
	96.05 Demonstrate the ability to prepare a topic outline.
	96.06 Write a draft of the design and testing report.
	96.07 Edit and proof the respective report.
	96.08 Prepare an electronically composed report in proper form.

97.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
97.01	Prepare a multi-media presentation on the completed project.
97.02	Make an oral presentation, using multi-media materials.
97.03	Review the presentation, and make changes in the delivery method(s) to improve presentation skills.
98.0	Demonstrate competency in the area of expertise related to the Applied Cybersecurity education program previously completed that this project is based upon. The student will be able to:
98.01	Demonstrate a mastery of the content of the selected subject area.
98.02	Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
98.03	Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.
98.04	Demonstrate the acquisition of additional knowledge, skill and experience in one area of the selected field of study beyond the performance standards of the initial program standards.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Applied Information Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y300400	
CIP Number	0511010302	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communication (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to computer application skills including computer hardware, software applications, web applications, computer programming, webpage design and advanced web tools, systems support and maintenance, network concepts, relational database concepts, multimedia tools, cybersecurity ; extensive exploration of information technology careers; strategies for success including goal setting, study skills, organizing skills, learning styles, employability skills, and service learning; and core academic skills with a strong emphasis on effective communication skills.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of eight occupational completion points. To complete this program, students must complete OCP A and OCP B, plus one or more of the subsequent OCPs (C-H).

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CTS0072	IT & Web Systems	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G	300 hours
C	CTS0063	Database Essentials		150 hours
D	CTS0030	Programming Fundamentals		150 hours
E	CTS0073	Web Development Fundamentals		150 hours
F	CTS0075	Multimedia Systems		150 hours
G	CTS0025	Computer Networking		150 hours
H	CTS0068	Cybersecurity Essentials		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Demonstrate proficiency on the principles of design.
17.0 Demonstrate proficiency planning an effective website.
18.0 Demonstrate proficiency using web development tools and techniques.
19.0 Demonstrate proficiency using specialized web design software.
20.0 Demonstrate proficiency gathering and preparing web content.
21.0 Demonstrate an awareness of preparing a website for launch.
22.0 Explain motherboard components, types and features.
23.0 Explain the purpose and characteristics of CPUs and their features.
24.0 Perform installation and configuration activities.
25.0 Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact.
26.0 Demonstrate knowledge of presentation production issues.
27.0 Demonstrate proficiency using computer networks.
28.0 Demonstrate proficiency communicating over the Internet.

29.0 Demonstrate proficiency in troubleshooting, repair and maintenance of hardware.
30.0 Demonstrate proficiency in the basic principles of security concepts and technologies.
31.0 Demonstrate proficiency in operational procedures as they relate to computer equipment and components.
32.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
33.0 Solve problems using critical thinking skills, creativity and innovation.
34.0 Use information technology tools.
35.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
36.0 Describe the importance of professional ethics and legal responsibilities.
37.0 Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs.
38.0 Develop the process of creating an entity by identifying relationships.
39.0 Formulate and assemble initial entity relationship by expanding on modeling concepts.
40.0 Consider the degree and optionality of relationships of entities.
41.0 Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams.
42.0 Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships.
43.0 Apply the complex ERM information by fine-tuning entities and the process for relating them.
44.0 Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved.
45.0 Manipulating data.
46.0 Building and modifying tables.
47.0 Performing queries and filtering records.
48.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
49.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
50.0 Explain the importance of employability skill and entrepreneurship skills.
51.0 Demonstrate personal money-management concepts, procedures, and strategies.
52.0 Plan program design.
53.0 Code programs.
54.0 Test programs.
55.0 Perform program maintenance.
56.0 Create and maintain documentation.
57.0 Develop an awareness of software quality assurance.
58.0 Develop an understanding of programming techniques and concepts.
59.0 Design structured programs.
60.0 Demonstrate proficiency in page design applicable to the WWW.
61.0 Demonstrate proficiency in webpage design applicable to the WWW.
62.0 Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design.
63.0 Demonstrate proficiency in using digital photography and digital imaging.
64.0 Design and create webpages suitable for publishing to the Internet.
65.0 Describe how website performance is monitored and analyzed.
66.0 Demonstrate proficiency in hosting a website.

67.0 Demonstrate the ability to attract and track traffic for a website.
68.0 Demonstrate knowledge of presentation production issues.
69.0 Demonstrate proficiency in using digital photography and digital imaging.
70.0 Demonstrate basic video production.
71.0 Demonstrate set-up and configuration of a computer for video applications.
72.0 Demonstrate the basic operation of a video workstation.
73.0 Demonstrate basic audio production.
74.0 Set-up and configure a computer for audio applications.
75.0 Operate an audio workstation.
76.0 Demonstrate proficiency in using presentation software and equipment.
77.0 Demonstrate understanding of network technologies.
78.0 Understand, install and configure network hardware.
79.0 Understand, install and configure networking devices.
80.0 Understand, install and configure network management software.
81.0 Understand, install and configure networking tools.
82.0 Install, configure, and manage network security hardware and software devices.
83.0 Demonstrate an understanding of cybersecurity, the terminology used, its history and culture, and trends.
84.0 Recognize the following types of malicious code and specify the appropriate actions to take to mitigate vulnerability and risk.
85.0 Recognize and be able to differentiate and explain the following access control models.
86.0 Compare and contrast methods of authentication.
87.0 Recognize the following attacks and specify the appropriate actions to take to mitigate vulnerability and risk.
88.0 The processes and risks associated with the following security concerns and tasks.
89.0 The administration of the following types of remote access technologies.
90.0 The administration of the following email security concepts.
91.0 The administration of the following Internet security concepts.
92.0 The administration of the following vulnerabilities.
93.0 The administration of the following directory security concepts.
94.0 The administration of the following file transfer protocols and concepts.
95.0 The administration of the following wireless technologies and concepts.
96.0 Compare and contrast the following types of intrusion detection in terms of implementation and configuration.
97.0 Be able to identify the following different kinds of cryptographic algorithms.
98.0 Understand how cryptography and digital signatures address the following security concepts.
99.0 Understand the following concepts of PKI (Public Key Infrastructure).
100.0 Understand the following concepts of Key Management and Certificate Lifecycles.

Florida Department of Education
Student Performance Standards

Program Title: Applied Information Technology
Career Certificate Program Number: Y300400

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)
Course Number: CTS0072 **Occupational Completion Point: B** **IT & Web Systems – 300 Hours**
16.0 Demonstrate proficiency on the principles of design. The student will be able to:
16.01 Identify industry best practices in visual design (e.g., color schemes, fonts, navigation methods, pagination).
16.02 Explain the key concepts of meeting client needs.
16.03 Apply the principles of Human Computer Interface (HCI) to design and develop an effective look and feel for a website.
16.04 Design and create a webpage for optimal display in multiple browsers.
17.0 Demonstrate proficiency planning an effective website. The student will be able to:
17.01 Compare and contrast site maps and wireframes.
17.02 Develop an effective site map for a website.
17.03 Create page layout wireframes for a website.
17.04 Classify web development tasks according to when they are performed during the web development cycle.
17.05 Describe the different types of business requirements that apply to website design.
17.06 Design business requirements to help ensure success for a specific website.
17.07 Demonstrate ability to use effective designer-client communication skills.
18.0 Demonstrate proficiency using web development tools and techniques. The student will be able to:
18.01 Compare and contrast writing HTML using a text editor versus using a WYSIWYG editor.
18.02 Design and create an effective webpage template.

	18.03 Create attractive, engaging, and efficient webpages using a WYSIWYG editor.
	18.04 Create an appropriate directory structure, naming convention protocol, and file organization for a website.
	18.05 Create DHTML and XML documents using editors or converters.
19.0	Demonstrate proficiency using specialized web design software. The student will be able to:
	19.01 Compare and contrast various specialized web design software (e.g., Photoshop, Dreamweaver).
	19.02 Demonstrate proficiency using various specialized web design software (e.g., Photoshop, Dreamweaver).
20.0	Demonstrate proficiency gathering and preparing and evaluating web content. The student will be able to:
	20.01 Characterize effective writing styles and conventions for the web.
	20.02 Create effective written content for the web.
	20.03 Prepare various types of graphical content for use on a webpage.
	20.04 Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD-ROMs).
	20.05 Create and edit images using image or graphic design software.
	20.06 Compare and contrast static versus dynamic web content.
	20.07 Evaluate sources for accuracy of content.
21.0	Demonstrate an awareness of preparing a website for launch. The student will be able to:
	21.01 Evaluate a website for basic usability and accessibility issues.
	21.02 List the steps that are necessary to determine when a website is ready to launch.
	21.03 Develop a User Testing Plan.
	21.04 Demonstrate the ability to organize and execute a user testing of a website in multiple browsers.
22.0	Explain motherboard components, types and features. The student will be able to:
	22.01 Identify different motherboard form factors (ATX/BTX and micro ATX).
	22.02 Identify input/output interfaces (e.g. USB, serial, NIC).
	22.03 Identify the different types of bus slots (e.g. PCI, AGP, PCMCIA).
	22.04 Identify the BIOS/CMOS/Firmware (e.g. POST, CMOS battery).
23.0	Explain the purpose and characteristics of CPUs and their features. The student will be able to:
	23.01 Identify types of CPUs (e.g. AMD, Intel).
	23.02 Define hyper threading.

	23.03 Explain multi core (e.g. dual, triple, quad).
	23.04 Explain the difference between onboard cache (e.g. L1, L2, L3).
	23.05 Compare and contrast between real and actual speed.
	23.06 Compare and contrast between 32 bit and 64 bit processing.
24.0	Perform installation and configuration activities. The student will be able to:
	24.01 Install and configure software including device drivers.
	24.02 Install and configure operating system software.
	24.03 Install and configure application software.
	24.04 Install and configure peripherals including device drivers (e.g., scanners, cameras, printers).
	24.05 Supervise the testing of operating system management systems (e.g., registry, INI files).
	24.06 Prepare the hard disk and related issues for operating system installation (e.g., BIOS, disk controllers).
	24.07 Format and partition the hard disk.
	24.08 Verify the proper operation of the system (e.g., physical inspection, tests, utilities).
	24.09 Compare and contrast memory technologies (e.g., RAM, ROM, virtual memory, memory management).
	24.10 Demonstrate proficiency using various memory technologies (e.g., RAM, ROM, virtual memory, memory management).
	24.11 Demonstrate proper use of user interfaces, command utilities and troubleshooting utilities.
	24.12 Explain the basics of boot sequences, methods and startup utilities.
25.0	Perform the process for problem diagnostics and problem resolution through wireless, infrared, telephone, e-mail, remote access, or direct contact. The student will be able to:
	25.01 Identify, troubleshoot and propose solutions for configuration problems.
	25.02 Identify, troubleshoot and propose solutions for software problems.
	25.03 Identify, troubleshoot and propose solutions for hardware malfunctions.
	25.04 Identify, troubleshoot and propose solutions for network malfunctions.
	25.05 Plan and implement a system upgrade and downgrade.
	25.06 Evaluate data recovery using various techniques (e.g., MBR repair tools, rescue disks, disk image, backup).
	25.07 Organize and perform system maintenance activities (e.g., management console, SNMP, system monitors, diagnostics, virus management).
	25.08 Demonstrate corporate interaction proficiency (e.g., responsibility, interaction, communication).
26.0	Demonstrate knowledge of presentation production issues. The student will be able to:

	26.01 Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedure.
	26.02 Demonstrate an understanding of graphic and other file formats (e.g., EPS, TIFF, JPEG, PNG, ASCII, MPEG, MIDI, AVI, WAV,) and knowledge of image size when scanning and saving files for use in different presentation types (web, computer, print).
	26.03 Identify display device connectors and types.
	26.04 Define refresh rate, resolution, multi-monitor and Degauss.
	26.05 Demonstrate knowledge of presentation vocabulary/terms.
	26.06 Compare and contrast and utilize various audio/video output solutions and devices.
	26.07 Compare and contrast removable storage.
27.0	Demonstrate proficiency using computer networks. The student will be able to:
	27.01 Define networking and describe the purpose of a network.
	27.02 Describe the conceptual background of digital networks including terminology and basics.
	27.03 Describe various types of networks and the advantages and disadvantages of each.
	27.04 Describe the use, advantages, and disadvantages of various network media.
	27.05 Describe the function of various network devices.
	27.06 Describe the difference between the internet and intranet.
	27.07 Compare and contrast IP Version 6 and IP Version 4.
	27.08 Compare and contrast the different network types.
	27.09 Compare and contrast various implementation models.
28.0	Demonstrate proficiency communicating over the Internet. The student will be able to:
	28.01 Display understanding of how Internet Service Providers (ISP) operate and what role they play in enabling users to connect to the Internet.
	28.02 Explain how the Internet works and how documents are connected and transferred.
	28.03 Configure an email client for SMTP and POP3 servers, including port assignment.
	28.04 Explain how the primary modes of Internet communication are used.
29.0	Demonstrate proficiency in troubleshooting, repair and maintenance of hardware. The student will be able to:
	29.01 Determine the troubleshooting methods and tools for peripheral devices.
	29.02 Explain and interpret common device issues and basic troubleshooting methods.
	29.03 Integrate common preventative maintenance techniques.
30.0	Demonstrate proficiency in the basic principles of security concepts and technologies. The student will be able to:

	30.01 Evaluate encryption technologies, software firewall, authentication technologies, and data security.
	30.02 Summarize the following security features (e.g. encryption, malicious software protection BIOS security, password management, biometrics).
31.0	Demonstrate proficiency in operational procedures as they relate to computer equipment and components. The student will be able to:
	31.01 Compare and contrast ESD, EMI, RFI, and electrical safety.
	31.02 Demonstrate proficiency in the use of state regulations for hazardous materials.
32.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	32.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	32.02 Locate, organize and reference written information from various sources.
	32.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	32.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	32.05 Apply active listening skills to obtain and clarify information.
	32.06 Develop and interpret tables and charts to support written and oral communications.
	32.07 Exhibit public relations skills that aid in achieving customer satisfaction.
33.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:
	33.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	33.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	33.03 Identify and document workplace performance goals and monitor progress toward those goals.
	33.04 Conduct technical research to gather information necessary for decision-making.
34.0	Use information technology tools. The student will be able to:
	34.01 Use personal information management (PIM) applications to increase workplace efficiency.
	34.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email and internet applications.
	34.03 Employ computer operations applications to access, create, manage, integrate and store information.
	34.04 Employ collaborative/groupware applications to facilitate group work.
35.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	35.01 Describe the nature and types of business organizations.
	35.02 Explain the effect of key organizational systems on performance and quality.

	35.03 List and describe quality control systems and/or practices common to the workplace.
	35.04 Explain the impact of the global economy on business organizations.
36.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	36.01 Evaluate and justify decisions based on ethical reasoning.
	36.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	36.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace or on social media.
	36.04 Interpret and explain written organizational policies and procedures.
Course Number: CTS0063 Occupational Completion Point: C Database Essentials – 150 Hours	
37.0	Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs. The student will be able to:
	37.01 Identify and analyze the phases of the database development process.
	37.02 Explain what conceptual data modeling and database design involves.
	37.03 Compare database development process with that of the application development process.
	37.04 Identify the need for databases and why they are used.
	37.05 Explain the various types of databases (i.e., flat file, relational) and the appropriate use of each.
	37.06 Demonstrate proficiency in design methodology by completing appropriate tasks during the appropriate time of the developmental life cycle.
	37.07 Demonstrate proficiency in design methodology by considering where the database will reside.
38.0	Develop the process of creating an entity by identifying relationships. The student will be able to:
	38.01 Identify and model various types of entities.
	38.02 Identify naming and drawing conventions for entities.
	38.03 Sequence the steps that are necessary for creation of an entity.
	38.04 Analyze and model the relationships between entities.
39.0	Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to:
	39.01 Analyze and model attributes.
	39.02 Identify unique identifiers for each entity.

	39.03 Develop an entity relationship diagram tagging attributes with optionality.
40.0	Consider the degree and optionality of relationships of entities. The student will be able to:
	40.01 Create models and entity relationship information requirements and interviews.
	40.02 Begin to differentiate between one-to-many, many-to-many and one-to-one relationships.
	40.03 Identify relationship between two entities by reading a given diagram.
	40.04 Create a relationship between instances of the same entity.
	40.05 Read an entity relationship model in order to validate it.
41.0	Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to:
	41.01 Identify the significance of an attribute that has more than one value for each entity instance.
	41.02 Evaluate appropriate methods of storing validation rules for attributes.
	41.03 Recognize unique identifiers inherited from other entities.
	41.04 Sequence the steps involved in resolving a many-to-many relationship.
42.0	Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to:
	42.01 Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID).
	42.02 Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships.
	42.03 Enforce referential integrity.
43.0	Apply the complex ERM information by fine-tuning entities and the process for relating them. The student will be able to:
	43.01 Describe a relational database and how it is different from other database systems.
	43.02 Define primary keys and foreign keys and describe their purpose.
	43.03 Describe what data integrity refers to and list some constraints.
	43.04 Explain how database design fits into the database development process.
	43.05 Translate an entity-relationship model into a relational database design.
44.0	Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to:
	44.01 Recognize raw data and evaluate the steps for creating a data group in unnormalized form (UNF).
45.0	Manipulating data. The student will be able to:
	45.01 Determine appropriate data inputs and outputs for an existing database.

	45.02 Demonstrate proficiency in record management (i.e., entering, editing, finding, selecting, sorting, deleting records).
	45.03 Change the layout of a datasheet.
	45.04 Create forms, reports, mailing labels, and charts using a database.
	45.05 Export data to appropriate software applications.
	45.06 Demonstrate proficiency in coordinating databases with appropriate software applications.
46.0	Building and modifying tables. The student will be able to:
	46.01 Create a database table.
	46.02 Create table structures and establish table relationships.
	46.03 Determine fields and assign data types in a database table.
	46.04 Demonstrate appropriate manipulation of database tables (i.e., enter data, add, delete records).
	46.05 Modify a database table by adding, deleting and removing fields.
	46.06 Demonstrate proficiency in the appropriate use of database wizards.
47.0	Performing queries and filtering records. The student will be able to:
	47.01 Design a query and extract specific data from a database table.
	47.02 Create a calculated field.
	47.03 Filter data in records by selection and by form.
	47.04 Modify a saved query.
	47.05 Explain what a Database Warehouse and its uses.
48.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student will be able to:
	48.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	48.02 Explain emergency procedures to follow in response to workplace accidents.
	48.03 Create a disaster and/or emergency response plan.
49.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	49.01 Employ leadership skills to accomplish organizational goals and objectives.
	49.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	49.03 Conduct and participate in meetings to accomplish work tasks.
	49.04 Employ mentoring skills to inspire and teach others.

50.0	Explain the importance of employability skill and entrepreneurship skills. The student will be able to:
50.01	Identify and demonstrate positive work behaviors needed to be employable.
50.02	Develop personal career plan that includes goals, objectives and strategies.
50.03	Examine licensing, certification and industry credentialing requirements.
50.04	Maintain a career portfolio to document knowledge, skills and experience.
50.05	Evaluate and compare employment opportunities that match career goals.
50.06	Identify and exhibit traits for retaining employment.
50.07	Identify opportunities and research requirements for career advancement.
50.08	Research the benefits of ongoing professional development.
50.09	Examine and describe entrepreneurship opportunities as a career planning option.
51.0	Demonstrate personal money-management concepts, procedures, and strategies. The student will be able to:
51.01	Identify and describe the services and legal responsibilities of financial institutions.
51.02	Describe the effect of money management on personal and career goals.
51.03	Develop a personal budget and financial goals.
51.04	Complete financial instruments for making deposits and withdrawals.
51.05	Maintain financial records.
51.06	Read and reconcile financial statements.
51.07	Research, compare and contrast investment opportunities.
Course Number: CTSS0030 Occupational Completion Point: D Programming Fundamentals – 150 Hours	
52.0	Plan program design. The student will be able to:
52.01	Formulate a plan to determine program specifications individually or in groups.
52.02	Use a graphical representation or pseudocode to represent the structure in a program or subroutine.
52.03	Design programs to meet business needs and requirements using problem-solving strategies.
52.04	Prepare proper input/output layout specifications.
52.05	Manually trace the execution of programs and verify that programs follow the logic of their design as documented.

	52.06 Analyze the business needs and requirements.
	52.07 Determine what kind of information the desired program must process.
	52.08 Formulate concise descriptions of a program's task and purpose.
	52.09 Formulate concise descriptions of task and purpose of a program's pieces.
	52.10 Organize programs according to the problem analysis.
	52.11 Recognize changes in the problem statement.
	52.12 Suggest changes in the program organization.
53.0	Code programs. The student will be able to:
	53.01 Write programs according to recognized programming standards.
	53.02 Write internal documentation statements as needed in the program source code.
	53.03 Code programs using logical statements (e.g., If-Then-Else, Do…While).
	53.04 Enter and modify source code using a program language editor.
	53.05 Code routines within programs that validate input data.
	53.06 Code programs using object-oriented languages (techniques).
	53.07 Select the essential aspects of a problem statement.
	53.08 Provide a solution to a problem.
	53.09 Find solutions to an extended problem statement.
	53.10 Utilize reference manuals and help systems.
	53.11 Use pre-defined functions within programs.
54.0	Test programs. The student will be able to:
	54.01 Develop a plan for testing programs.
	54.02 Develop data for use in program testing.
	54.03 Perform debugging activities.
	54.04 Distinguish among the different types of program and design errors.
	54.05 Evaluate program test results.
	54.06 Execute programs and subroutines as they relate to the total application.
	54.07 Develop examples that illustrate the core behavior of each program.

	54.08 Develop examples that illustrate the core behavior of each program component.
	54.09 Illustrate the behavior of boundary cases.
	54.10 Demonstrate an understanding that engineering artifacts requires rigorous and systematic testing.
	54.11 Use examples to show that the solution meets pre-determined criteria.
	54.12 Demonstrate understanding that testing can expose problems but not prove the correctness of the design in an absolute sense.
	54.13 Compile (interpret) and run programs.
55.0	Perform program maintenance. The student will be able to:
	55.01 Analyze output to identify and annotate errors or enhancements.
56.0	Create and maintain documentation. The student will be able to:
	56.01 Follow established documentation standards.
57.0	Develop an awareness of software quality assurance. The student will be able to:
	57.01 Identify the legal and social consequences of errors in software.
	57.02 Describe copyright and other laws that relate to software theft and misuse.
	57.03 Describe software security measures to protect computer systems and data from unauthorized use and tampering (e.g., physical security, passwords, encryption, virus protection/prevention).
	57.04 Develop an awareness of version control systems and Open Source Software.
58.0	Develop an understanding of programming techniques and concepts. The student will be able to:
	58.01 Identify the basic constructs used in structured programming.
59.0	Design structured programs. The student will be able to:
	59.01 Design programs that model mathematical relationships from application areas (e.g., accounting, economics, multimedia, programming, science, web).
	59.02 Design programs that deal with multi-faceted objects (e.g., personnel records, physical objects, attributes of HTML tags).
	59.03 Design programs that deal with mixed classes of objects (e.g., a class of geometric shapes containing circles, rectangles, triangles, squares, polygons).
	59.04 Design programs that deal with objects of undetermined size (e.g., shopping lists, family trees, file directories on computers, websites).
Course Number: CTS0073 Occupational Completion Point: E Web Development Fundamentals – 150 Hours	
60.0	Demonstrate proficiency in page design applicable to the WWW. The student will be able to:

	60.01 Identify and convert graphic formats.
	60.02 Demonstrate proficiency in adding Java scripts to webpages.
61.0	Demonstrate proficiency in webpage design applicable to the WWW. The student will be able to:
	61.01 Determine the objectives and the audience for webpages.
	61.02 Identify design strategies to reach and keep an audience.
	61.03 Use storyboarding to plan a website.
	61.04 Create styles and other design elements (e.g. backgrounds, colors, fonts, buttons).
62.0	Demonstrate proficiency in using a WYSIWG editor, web design, or web animation software for webpage design. The student will be able to:
	62.01 Apply style sheets for consistent website design.
	62.02 Create and edit images and photographs for webpages using digital imaging software (e.g., ImageReady in Photoshop).
	62.03 Insert audio files into a webpage.
	62.04 Create, edit and integrate video files into a webpage.
	62.05 Create, edit and integrate animation files into a webpage.
	62.06 Demonstrate an understanding of photograph compression factors such as transmission speed, color reduction, and browser support.
	62.07 Demonstrate knowledge of image formats related to photos and graphics on the Internet (e.g. Graphic formats (TIFF & EPS), Web formats (JPEG, GIF, PNG).
	62.08 Save and export a photograph to the web in the format best for image quality and file size.
	62.09 Build, optimize, edit, and test web pages for publication.
	62.10 Create a webpage that utilizes plug-ins.
	62.11 Demonstrate an understanding of network and web implementation issues (e.g., bandwidth, compression, streaming).
	62.12 Compare and contrast various methods by which information may be accessed on the Internet/Intranet (e.g., FTP, telnet, browser).
	62.13 Demonstrate an understanding of file encryption methods (e.g., secure server, unsecured server).
63.0	Demonstrate proficiency in using digital photography and digital imaging. The student will be able to:
	63.01 Demonstrate knowledge of ethics related to digital imaging, legal and consent issues.
	63.02 Apply effective design principles in digital photography compositions.
	63.03 Illustrate the essence of an event, quote, or slogan through digital photography/imaging.
	63.04 Demonstrate skill in using digital imaging software for image manipulation, color correction and special effects to creatively convey a message or literary interpretation.

	63.05 Demonstrate skill in scanning and cropping photographs.
64.0	Design and create webpages suitable for publishing to the Internet. The student will be able to:
	64.01 Explain the need for web-based applications.
	64.02 Evaluate a website for basic usability and accessibility issues.
	64.03 Display an understanding of the purposes of site maps and wireframes.
	64.04 Develop an effective site map for a website.
	64.05 Develop effective wireframes for a website.
	64.06 Identify industry best practices in visual design.
	64.07 Explain the key concepts of meeting client needs.
	64.08 Develop an effective look and feel for a website.
	64.09 Develop an effective webpage template.
	64.10 Describe a correct directory structure, naming convention protocol and file organization for a website.
	64.11 Characterize effective writing for the web.
	64.12 Create effective written content for the web.
	64.13 Decide how to best prepare various types of graphical content for use on a web page.
	64.14 Develop a User Testing Plan.
	64.15 List the steps that are necessary to determine when a website is ready to launch.
	64.16 Demonstrate the ability to organize and execute a user testing of a website.
65.0	Describe how website performance is monitored and analyzed. The student will be able to:
	65.01 Identify issues related to website maintenance.
	65.02 Use webpage validation tools.
	65.03 Describe website performance metrics (e.g., visits, time-on-page, time-on-site) and discuss their design implications.
	65.04 Demonstrate knowledge of accessibility problems and solutions.
	65.05 Examine indexing, page ranking, basic Search Engine Optimization techniques.
	65.06 Explore common website analytic tools.
	65.07 Construct webpages with streaming media content.
66.0	Demonstrate proficiency in hosting a website. The student will be able to:

66.01	Apply professional guidelines to choose, search for and register a domain name.
66.02	Evaluate criteria upon which to select an appropriate web host.
66.03	Make generalizations about optimal download speed for a particular website.
66.04	Demonstrate the ability to upload and download files using FTP protocol.
66.05	Develop a Maintenance Plan for a client.
67.0	Demonstrate the ability to attract and track traffic for a website. The student will be able to:
67.01	Explain and describe the best practices for attracting traffic to websites.
67.02	Evaluate an effective search engine optimization strategy.
67.03	Describe tactics for building online credibility.
67.04	Explain how to use standard techniques to gather and/or track site statistics.
Course Number: CTS0075 Occupational Completion Point: F Multimedia Systems – 150 Hours	
68.0	Demonstrate knowledge of presentation production issues. The student will be able to:
68.01	Identify characteristics of various types of presentations (e.g., informing, selling, teaching, entertaining).
68.02	Identify presentation materials (e.g., handouts, seminar notebooks, business cards, coupons) and presentation marketing mediums (i.e., print media such as newspaper, magazines; TV; movies; computer presentations; interactive CD ROM; kiosks, webpages).
68.03	Identify design characteristics (e.g., fonts, size and styles, backgrounds) that are suited for each type of presentation format and material.
68.04	Demonstrate knowledge of copyright laws including copyright statute, disclaimers, and filing procedures.
68.05	Research and identify skills needed for career positions in multimedia.
68.06	Demonstrate an understanding of graphic and other file formats (e.g., EPS, TIFF, JPEG, ASCII, MPEG, MIDI, AVI, WAV) and knowledge of image size when scanning and saving files for use in different presentation types (e.g., web, computer, print).
68.07	Demonstrate knowledge of presentation vocabulary/terms.
69.0	Demonstrate proficiency in using digital photography and digital imaging. The student will be able to:
69.01	Demonstrate knowledge of ethics related to digital imaging, legal and consent issues.
69.02	Apply effective design principles in digital photography compositions.
69.03	Illustrate the essence of an event, quote, or slogan through digital photography/imaging.
69.04	Demonstrate skill in using digital imaging software for image manipulation, color correction, and special effects to creatively convey a message or literary interpretation.

	69.05	Demonstrate skill in scanning and cropping photographs.
	69.06	Incorporate scanned or digitally taken photographs into documents (poster, brochure, card, photo journalism story, report or book covers, letterhead) that have been designed using desktop publishing software or the desktop publishing features of word processing software.
70.0	Demonstrate basic video production. The student will be able to:	
	70.01	Use student device or current industry standard production video equipment.
	70.02	Operate camera in studio and location (field) production environments.
	70.03	Demonstrate understanding of digital video storage concepts and digital storage media.
	70.04	Demonstrate knowledge of and the ability to operate digital recording decks, and other digital storage devices.
	70.05	Identify and select microphones for production needs.
	70.06	Determine appropriate lighting needs for production settings.
	70.07	Identify location and studio lighting types, method of use and application.
71.0	Demonstrate set-up and configuration of a computer for video applications. The student will be able to:	
	71.01	Install basic peripheral devices related to video programs.
	71.02	Install and configure software related to video programs.
	71.03	Demonstrate basic knowledge of computer system requirements.
	71.04	Demonstrate basic knowledge of installing plug-ins or additional audio source material such as beats and or samples.
	71.05	Understand the signal flow of a digital video workstation.
72.0	Demonstrate the basic operation of a video workstation. The student will be able to:	
	72.01	Demonstrate knowledge of the digital video workstation interface.
	72.02	Demonstrate a working familiarity and understanding of the function and operation of digital video workstations.
	72.03	Describe a full digital media production cycle.
	72.04	Demonstrate ability to edit, cut, erase, and insert video utilizing various digital production techniques.
	72.05	Record video directly to the digital video workstation.
	72.06	Demonstrate knowledge of editing video according to message.
	72.07	Demonstrate skill in using video effects and plug-ins.
	72.08	Describe a first complete run-through of the video production process.
	72.09	Characterize the qualities of effective communication in a completed video.

	72.10 Prepare a video project for final compositing and export.
	72.11 Transfer video files between various video software applications.
	72.12 Export finished video.
	72.13 Identify and describe solutions to the challenges and obstacles that arise in a video production.
73.0	Demonstrate basic audio production. The student will be able to:
	73.01 Describe digital audio storage concepts and digital storage media.
	73.02 Operate digital recording decks and other digital storage devices.
	73.03 Describe the function and operation of digital audio workstations.
	73.04 Edit, cut, erase and insert sound utilizing various digital production techniques.
	73.05 Perform digital noise reduction and noise extraction via spectral display.
74.0	Set-up and configure a computer for audio applications. The student will be able to:
	74.01 Install basic peripheral devices related to audio programs.
	74.02 Install and configure software related to audio programs.
	74.03 Demonstrate basic knowledge of computer system requirements.
	74.04 Install plug-ins or additional audio source material such as beats and or samples.
	74.05 Diagram the signal flow of a digital audio workstation.
75.0	Operate an audio workstation. The student will be able to:
	75.01 Demonstrate knowledge of the digital audio workstation interface.
	75.02 Create and arrange a multi-track project.
	75.03 Create interest and effect using editing techniques
	75.04 Design and edit audio using a waveform editor.
	75.05 Record audio directly to the digital audio workstation.
	75.06 Mix audio.
	75.07 Demonstrate skill in using audio effects and plug-ins.
	75.08 Prepare an audio project for finishing and final mix down.
	75.09 Transfer audio files between various audio software applications.
	75.10 Demonstrate the understanding of audio file bit depth, bandwidth and dithering and be able to explain when and where these apply in various applications of digital audio production.

	75.11 Export finished audio.
76.0	Demonstrate proficiency in using presentation software and equipment. The student will be able to:
	76.01 Using presentation software, create a multimedia presentation that incorporates shot and edited video, animation, music, narration and adheres to good design principles, use of transitions, and effective message conveyance.
	76.02 Demonstrate knowledge of the roles and responsibilities of a multimedia production team (e.g. project manager, creative or design director, content experts, writers, graphic designers, animators, sound designers, videographer, interface designers/programmers).
	76.03 Collaborate with team members to plan, edit, evaluate, and present a multimedia presentation.
Course Number: CTS0025 Occupational Completion Point: G Computer Networking – 150 Hours	
77.0	Demonstrate understanding of network technologies. The student will be able to:
	77.01 Explain the function of common networking protocols such as TCP, FTP, UDP, TCP/IP suite, DHCP, TFTP, DNS, HTTP(S), ARP, SIP (VoIP), RTP (VoIP), SSH, POP3, NTP, IMAP4, TELNET, SMTP, SNMP 2/3, ICMP, IGMP and TLS.
	77.02 Identify commonly used TCP and UDP default ports such as the following: TCP ports, FTP – 20, 21, SSH – 22, TELNET – 23, SMTP – 25, DNS – 53, HTTP – 80, POP3 – 110, NTP – 123, IMAP4 – 143, HTTPS – 443, UDP ports TFTP – 69, DNS – 53, BOOTPS/DHCP – 67 and SNMP – 161.
	77.03 Identify the following address formats IPv6, IPv4, and MAC Addressing.
	77.04 Evaluate the proper use of the following addressing technologies and addressing schemes: Subnetting, Classful vs. classless (e.g. CIDR, Supernetting), NAT, PAT, SNAT, Public vs. private, DHCP (static, dynamic APIPA), Addressing schemes, Unicast and Multicast, Broadcast.
	77.05 Identify common IPv4 and IPv6 routing protocols - Link state OSPF, IS-IS, Distance vector, RIP, RIPv2, BGP and Hybrid EIGRP.
	77.06 Explain the purpose and properties of routing such as IGP vs. EGP, Static vs. dynamic, Next Hop, understanding routing tables and how they pertain to path selection, and explain convergence (steady state).
	77.07 Compare the characteristics of wireless communication standards such as 802.11 a/b/g/n, speeds, distance, channels, frequency, authentication and encryption such as WPA, WEP, RADIUS and TKIP.
78.0	Understand, install, and configure network hardware. The student will be able to:
	78.01 Categorize standard cable types and their properties such as CAT3, CAT5, CAT5e, CAT6, STP, UTP, Multimode fiber, single-mode fiber, coaxial, serial, plenum vs non-plenum, transmission speeds, distance, duplex, noise immunity (security, EMI), and frequency.
	78.02 Identify common connector types such as RJ-11, RJ-45, BNC, SC, ST, LC and RS-232.
	78.03 Identify common physical network topologies such as Star, Mesh, Bus, Ring, Point to Point, Point to Multipoint, and Hybrid.
	78.04 Differentiate and implement appropriate wiring standards such as 568A, 568 B Straight vs cross over, rollover, and Loopback.
	78.05 Categorize Wan technologies types and properties such as Frame Relay, E1/T1, ADSL, SDSL, VDSL, Cable modem, Satellite, E3/T3, Oc-x, Wireless, ATM, SONET, MPLS, ISD Bri, ISDN PRI, POTS, PSTN, Circuit, switch, packet switch, speed, transmission media, and Distance.

	78.06	Categorize LAN technology types and properties such as Ethernet, 10BaseT, 100BaseTX, 100BaseFX, 1000BaseT, 1000BaseX, 10GbaseSR, 10GBaseLR, 10GBaseER, 10GBaseSW, 10GBaseLW, 10GBaseEW, 10GBaseT and properties of each such as CSMA/CD, Broadcast, Collision, Bonding, Speed, and Distance.
	78.07	Explain common logical network topologies and their characteristics such as peer to peer, client/server, VPN and VLAN.
	78.08	Install components of wiring distribution such as Vertical and horizontal cross connects, Patch panels, 66 block, MDFs, IDFs, 25 pair, 100 pair, 110 block, Demarc, Demarc extension, Smart jack, verify wiring installation and Verify wiring termination.
79.0	Understand, install and configure networking devices. The student will be able to:	
	79.01	Install, configure and differentiate between common network devices such as hub, repeater, modem, NIC, media converters, basic switch, bridge, wireless access point, basic router, basic firewall and basic DHCP server.
	79.02	Identify the function of specialized network devices such as multilayer switch, Content switch, IDS/IPS, load balancer, multifunction network devices, DNS server Bandwidth shaper, proxy server, and CSU/DSU.
	79.03	Explain the advance features of a switch such as PoE, Spanning tree, VLAN, Trunking, Port mirroring, and Port Authentication.
	79.04	Implement a basic wireless network using the following technologies installed client, access point placement, access point with encryption, access point with configured channels and frequencies, and a set ESSSID and beacon.
80.0	Understand, install and configure network management software. The student will be able to:	
	80.01	Explain the function of the OSI layer model such as physical, data link, network, transport, session, presentation and application.
	80.02	Identifies types of configuration management documentation such as wiring schematics, physical and logical network diagram, baselines, policies, procedure and configuration and regulations.
	80.03	Evaluate the network based on configuration management documentation such as compare wiring schematics, physical and logical network diagrams, baselines, policies and procedures, and configurations to network devices and infrastructure, and update wiring schematics, physical and logical network diagrams, configuration and job logs as needed.
	80.04	Conduct network monitoring to identify performance and connectivity issues using the following: network monitoring utilities (packet sniffers, connectivity software, load testing, throughput testers) and system logs, history and event log.
	80.05	Conduct network monitoring to identify performance and connectivity issues using the following: network monitoring utilities (packet sniffers, connectivity software, load testing, and throughput testers), system logs, history logs, and event logs.
	80.06	Explain different methods and rationales for network performance optimization such as QoS, Traffic shaping, Load balancing, high availability, Caching engines, Fault tolerance, Latency sensitivity, High bandwidth applications, VoIP, Video applications, and Uptime.
	80.07	Implement the following network troubleshooting methodology - Information gathering, identify symptoms and problems, Identify the affected areas of the network, determine if anything has changed, Establish the most probable cause, determine if escalation is necessary, create an action plan and solution identifying potential effects, Implement and test the solution, Identify the results and effects of the solution, and Document the solution and the entire process.
	80.08	Troubleshoot common connectivity issues and select an appropriate solution Physical issues: Cross talk, Near End crosstalk, Attenuation, collisions, Shorts Open, Impedance mismatch (echo), and Interference - Logical issues: Port speed, Port duplex mismatch, incorrect VLAN, Incorrect IP address, Wrong gateway, Wrong DNS, Wrong subnet mask, Issues that should be identified but escalated: Switching loop, Routing loop, Route problems, Proxy arp, Broadcast storms, Wireless Issues: Interference (bleed, environmental factors), incorrect encryption, Incorrect channel, Incorrect frequency, ESSID mismatch, Standard mismatch (802.11

	a/b/g/n), Distance, Bounce, and Incorrect antenna placement.
81.0	Understand, install and configure networking tools. The student will be able to:
81.01	Select the appropriate command line interface tool and interpret the output to verify functionality such as Traceroute, Ipconfig, IFconfig, Ping, Arp ping, Arp, Nslookup, Hostname, Dig, Mtr, Route, and Nbtstat.
81.02	Explain the purpose of network scanners such as Packet sniffers, Intrusion detection software, Intrusion prevention software and Port scanners.
81.03	Utilize the appropriate hardware tools such as Cable testers, Protocol analyzer, Certifiers, TDR, OTDR, Multimeter, Toner probe, Butt set, Punch down tool, Cable stripper, Snips, Voltage event recorder, and Temperature monitor.
82.0	Install, configure, and manage network security hardware and software devices. The student will be able to:
82.01	Explain the function of hardware and software security devices such as Network based firewall, Host based firewall, IDS, IPS, and VPN concentrator.
82.02	Explain common features of a firewall for example: Application layer vs. network layer, Stateful vs. stateless, Scanning services, Content filtering, Signature identification, and Zones.
82.03	Explain the methods of network access security using the following: Filtering: ACL, MAC filtering, IP filtering, Tunneling and encryption, SSL VPN, VPN, L2TP, PPTP, IPSEC, Remote access, RAS, RDP, PPPoE, PPP, VNC, and ICA.
82.04	Explain methods of user authentication using the following methods: PKI, Kerberos, AAA, RADIUS, TACACS+, Network access control, 802.1x, CHAP, MS-CHAP, and EAP.
82.05	Explain issues that affect device security such as the Physical security, Restricting local and remote access, Secure methods vs. unsecure methods, SSH, HTTPS, SNMPv3, SFTP, SCP, and TELNET, HTTP, FTP, RSH, RCP and SNMPv1/2.
82.06	Identify common security threats and mitigation techniques such as Security threats, DoS, Viruses, Worms, Attackers, Man in the middle, murf, Rogue access points, Social engineering (phishing), Mitigation techniques, Policies and procedures, User training, Patches and updates.
Course Number: CTS0068 Occupational Completion Point: H Cybersecurity Essentials – 150 Hours	
83.0	Demonstrate an understanding of cybersecurity, the terminology used, its history and culture, and trends. The student will be able to:
83.01	Describe the history of cybersecurity, including the evolution of a hacker culture.
83.02	Discuss the trends and national initiatives related to cybersecurity.
83.03	Distinguish between information assurance and cybersecurity.
83.04	Describe the concepts of confidentiality as it relates to user and data impact.
83.05	Explain authentication and the concept of non-repudiation.
83.06	Describe the concept of “Hacking - The Human Element” and elaborate on its implications to cybersecurity.
84.0	Recognize the following types of malicious code and specify the appropriate actions to take to mitigate vulnerability and risk. The student

	will be able to:
	84.01 Describe viruses.
	84.02 Identify Trojan Horses.
	84.03 Explain Logic Bombs.
	84.04 Describe worms.
	84.05 Explain exploit kits.
	84.06 Identify kill chains.
85.0	Recognize and be able to differentiate and explain the following access control models. The student will be able to:
	85.01 Define MAC (Mandatory Access Control).
	85.02 Define DAC (Discretionary Access Control).
	85.03 Define RBAC (Role Based Access Control).
86.0	Compare and contrast methods of authentication. The student will be able to:
	86.01 Identify Kerberos.
	86.02 Explain CHAP (Challenge Handshake Authentication Protocol).
	86.03 Define certificates.
	86.04 Apply username/password.
	86.05 Identify tokens.
	86.06 Describe multi-factor.
	86.07 Define mutual.
	86.08 Define biometrics.
87.0	Recognize the following attacks and specify the appropriate actions to take to mitigate vulnerability and risk. The student will be able to:
	87.01 Explain DOS/DDOS (Denial of Service/Distributed Denial of Service).
	87.02 Explain Back Door.
	87.03 Identify spoofing.
	87.04 Describe Man in the Middle.
	87.05 Describe replay.
	87.06 Explain TCP/IP Hijacking.

	87.07	List Weak Keys.
	87.08	Design password security measures to eliminate guessing (e.g., Brute Force, Dictionary, Mathematical, Social Engineering, Birthday).
	87.09	Describe Software Exploitation.
88.0	The he processes and risks associated with the following security concerns and tasks. The student will be able to:	
	88.01	Identify non-essential services and protocols and know what actions to take to reduce the risks of those services and protocols.
	88.02	Understand the concept of and know how reduce the risks of social engineering.
	88.03	Understand the concept and significance of auditing, logging and system scanning.
	88.04	Identify and be able to differentiate different cryptographic standards and protocols.
89.0	The administration of the following types of remote access technologies. The student will be able to:	
	89.01	Recognize 802.1x.
	89.02	Understand VPN (Virtual Private Network).
	89.03	Discuss RADIUS (Remote Authentication Dial-In User Service).
	89.04	Describe TACACS (Terminal Access Controller Access Control System).
	89.05	Generalize L2TP/PPTP (Layer Two Tunneling Protocol/Point to Point Tunneling Protocol).
	89.06	Define SSH (Secure Shell).
	89.07	Give examples of IPSEC (Internet Protocol Security).
	89.08	List security vulnerabilities.
90.0	The administration of the following email security concepts. The student will be able to:	
	90.01	Explain S/MIME (Secure Multipurpose Internet Mail Extensions).
	90.02	Describe PGP (Pretty Good Privacy) like technologies.
	90.03	List security vulnerabilities.
	90.04	Identify SPAM.
	90.05	Analyze hoaxes.
	90.06	Track SMTP headers.
91.0	The administration of the following Internet security concepts. The student will be able to:	
	91.01	Recognize SSL/TLS (Secure Sockets Layer/Transport Layer Security).
	91.02	Understand HTTP/S (Hypertext Transfer Protocol/Hypertext Transfer Protocol over Secure Sockets Layer).

	91.03 List security vulnerabilities.
92.0	The administration of the following vulnerabilities. The student will be able to:
	92.01 Discuss Java Script.
	92.02 Explain ActiveX.
	92.03 Identify Buffer Overflows.
	92.04 Understand Cookies.
	92.05 Explain Signed Applets.
	92.06 Identify CGI (Common Gateway Interface).
	92.07 Describe SMTP (Simple Mail Transfer Protocol) Relay.
93.0	The administration of the following directory security concepts. The student will be able to:
	93.01 Recognize SSL/TLS (Secure Sockets Layer/Transport Layer Security).
	93.02 Recognize LDAP (Lightweight Directory Access Protocol).
94.0	The administration of the following file transfer protocols and concepts. The student will be able to:
	94.01 Identify S/FTP (File Transfer Protocol).
	94.02 Identify Blind FTP (File Transfer Protocol)/Anonymous.
	94.03 Understand File Sharing.
	94.04 List security vulnerabilities.
95.0	The administration of the following wireless technologies and concepts. The student will be able to:
	95.01 Recognize WTLS (Wireless Transport Layer Security).
	95.02 Recognize 802.11 and 802.11x.
	95.03 Recognize WEP/WAP (Wired Equivalent Privacy/Wireless Application Protocol).
	95.04 List security vulnerabilities.
96.0	Compare and contrast the following types of intrusion detection in terms of implementation and configuration. The student will be able to:
	96.01 Discuss Network Based – Active and Passive.
	96.02 Discuss Host Based – Active and Passive.
	96.03 Explain Honey Pots.
	96.04 Describe Incident Response.

97.0	Be able to identify and explain the following different kinds of cryptographic algorithms. The student will be able to:
	97.01 Explain Hashing.
	97.02 Explain Symmetric.
	97.03 Explain Asymmetric.
98.0	Understand how cryptography and digital signatures address the following security concepts. The student will be able to:
	98.01 Discuss confidentiality.
	98.02 Evaluate integrity.
	98.03 Determine authentication.
	98.04 Ensure non-repudiation.
	98.05 Evaluate access control.
99.0	Understand the following concepts of PKI (Public Key Infrastructure). The student will be able to:
	99.01 Explain certificates (e.g., policies, practice statements).
	99.02 Discuss revocation.
	99.03 Identify trust models.
100.0	Understand the following concepts of Key Management and Certificate Lifecycles. The student will be able to:
	100.01 Compare and contrast centralized versus decentralized.
	100.02 Compare and contrast hardware versus software key storage.
	100.03 Explain private key storage.
	100.04 Identify escrow.
	100.05 Explain expiration.
	100.06 Compare and contrast revocation versus suspension (e.g., status checking).
	100.07 Interpret recovery authorization schema (e.g., M-of-N Control - Of M appropriate individuals, N must be present to authorize recovery).
	100.08 Explain renewal.
	100.09 Give examples of destruction.
	100.10 Discuss key usage.
	100.11 Compare and contrast multiple key pairs (Single, Dual).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communication (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Enterprise Network and Server Support Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y300500	
CIP Number	0511100123	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA, PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of occupations in the Information Technology industry.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Information Technology industry; technical and product skills, underlying principles of technology, planning, management, finance, labor issues, community issues and health, safety, and environmental issues.

The content includes but is not limited to communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points. When the recommended sequence is followed, the structure is intended to prepare students to complete the CompTIA Security+, the Certified Ethical Hacker, Cisco Certified Network Associate and the Microsoft Certified System Administrator industry certifications. A student who completes the applicable competencies at any occupational completion point may either continue with the training or become an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0099	Advanced Networking Fundamentals	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G INFO TECH 7 G CYBER TECH 7 G ELECTRONIC @7 ?7 G	150 hours
B	CTS0066	Information Technology Security Specialist **OR**		600 hours
	CTS0094	Interconnecting Cisco Network Devices **OR**		600 hours
	CTS0048	Microsoft Certified Systems Administrator		600 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify networks and components.
02.0 Describe the role of an Information Technology Security Specialist.
03.0 Describe the role of a Cisco Engineer.
04.0 Describe the role of a Microsoft Certified Systems Administrator.
05.0 Understand Cloud services.
06.0 Explore career options.
07.0 Demonstrate an understanding of Network Security.
08.0 Demonstrate Compliance and Operational Security.
09.0 Demonstrate an understanding of threats and vulnerabilities.
10.0 Demonstrate Use of Application, Data and Host Security.
11.0 Demonstrate proficiency and understanding of Access Control and Identity Management.
12.0 Demonstrate proficiency and understanding in Cryptography.
13.0 Demonstrate use of Ethical Hacking.
14.0 Demonstrate proficiency in Understanding the technical foundations of hacking.
15.0 Demonstrate an understanding of foot printing and scanning.
16.0 Demonstrate proficiency and understanding of enumeration and system hacking.
17.0 Demonstrate proficiency Linux and automated assessment tools.
18.0 Demonstrate understanding of Trojans and backdoors.
19.0 Demonstrate understanding of Sniffers, session hijacking, and denial of service.
20.0 Demonstrate understanding and proficiency in web server hacking, web application and database attack.
21.0 Demonstrate understanding and proficiency in wireless technologies, mobile security and attacks.
22.0 Demonstrate understanding and proficiency in configuring IDS, Firewalls, and Honeypots.
23.0 Explain use of buffer overflows, viruses, and worms.
24.0 Employing cryptographic attacks and defenses.
25.0 Demonstrate use of physical security and social engineering.
26.0 Describe the operation of data networks.
27.0 Demonstrate proficiency in LAN Switching Technologies.
28.0 Understand, IP addressing (IPv4/IPv6).
29.0 Demonstrate proficiency in IP Routing Technologies.
30.0 Demonstrate proficiency in IP Services.
31.0 Demonstrate proficiency in Network Device Security.
32.0 Demonstrate proficiency in Troubleshooting VLANs, Trunking and ACLs.
33.0 Demonstrate proficiency in LAN Switching Technologies.
34.0 Demonstrate proficiency in IP Routing Technologies.
35.0 Demonstrate proficiency in IP Services.
36.0 Demonstrate proficiency in troubleshooting network problems.

37.0 Demonstrate proficiency in WAN Technologies.
38.0 Demonstrate knowledge and skills in installing and configuring servers.
39.0 Demonstrate knowledge and skills in configuring server roles and features.
40.0 Demonstrate knowledge and skills in configuring Hyper-V.
41.0 Demonstrate knowledge and skills in deploying and configuring core network services.
42.0 Demonstrate knowledge and skills in installing and administering active Directory.
43.0 Demonstrate knowledge and skills in creating and managing Group Policy.
44.0 Demonstrate knowledge and skills in administering Windows Server.
45.0 Demonstrate knowledge and skills in configuring Advanced Windows Server Services.

Florida Department of Education
Student Performance Standards

Program Title: Enterprise Network and Server Support Technology
Career Certificate Program Number: Y300500

Course Number: CTS0099 **Occupational Completion Point: A** **Advanced Networking Fundamentals – 150 Hours**	
01.0	Identify networks and components. The student will be able to:
01.01	Research enterprise scenarios to determine network infrastructure.
01.02	Identify network components and relationships (cables, switches, software, power).
01.03	Identify typical equipment found in a MDF and IDF closet.
01.04	Identify business services that rely on a network or create network traffic (security, marketing, retail).
01.05	Design a network implementation plan for a small business enterprise.
02.0	Describe the role of an Information Technology Security Specialist. The student will be able to:
02.01	Identify network security risks in an organization.
02.02	Analyze security risks for solutions.
02.03	Develop a security plan for a small business network.
02.04	Identify security standards both physical and computer software related.
03.0	Describe the role of a Cisco Engineer. The student will be able to:
03.01	Identify switch and router technology being used in enterprise.
03.02	Investigate the configuration of switches and routers in an enterprise.
03.03	Develop a deployment plan for using network devices in enterprise.
03.04	Explain wireless connections and configuration for switches and routers.
03.05	Analyze (Switch/Router) price vs. performance in an enterprise.
04.0	Describe the role of a Microsoft Certified Systems Administrator. The student will be able to:
04.01	Explain the importance system administration.
04.02	Identify key software and hardware being used for server administration.
04.03	Identify software and hardware considerations before deployment.

	04.04 Develop a deployment plan for a small enterprise.
05.0	Understand Cloud services. The student will be able to:
	05.01 Identify clouds services currently available.
	05.02 Compare and contrast the use of cloud services in an enterprise.
	05.03 Identify hardware and software requirements for deploying a cloud service in an enterprise.
	05.04 Develop a clouds services plan for a small enterprise.
06.0	Explore career options. The student will be able to:
	06.01 Identify job opportunities and qualifications needed to be a network security technician.
	06.02 Identify job opportunities and qualifications needed to be a Cisco technician.
	06.03 Identify job opportunities and qualifications needed to be Microsoft certified systems administrator.
Course Number: CTS0066 Occupational Completion Point: B Information Technology Security Specialist – 600 Hours	
07.0	Demonstrate an understanding of Network Security. The student will be able to:
	07.01 Implement security configuration parameters on network devices and other technologies.
	07.02 Given a scenario, use secure network administration principles (VLANs, Firewalls).
	07.03 Explain various career options within the IT enterprise.
	07.04 Given a scenario, implement common protocols and services (FTPS, DNS, Ports – 21-22-25).
	07.05 Given a scenario, troubleshoot security issues related to wireless networking.
08.0	Demonstrate Compliance and Operational Security. The student will be able to:
	08.01 Explain the importance of risk related concepts.
	08.02 Summarize the security implications of integrating systems and data with third parties.
	08.03 Given a scenario, implement appropriate risk mitigation strategies.
	08.04 Given a scenario, implement basic forensic procedures.
	08.05 Summarize common incident response procedures.
	08.06 Explain the importance of security related awareness and training.
	08.07 Compare and contrast physical security and environmental controls.

	08.08 Summarize risk management best practices.
	08.09 Given a scenario, select the appropriate control to meet the goals of security (Encryption, Hashing).
09.0	Demonstrate an understanding of threats and vulnerabilities. The student will be able to:
	09.01 Explain types of malware (Viruses, Adware).
	09.02 Summarize various types of attacks (DoS, DDoS, Smurf attack).
	09.03 Summarize social engineering attacks and the associated effectiveness with each attack.
	09.04 Explain types of wireless attacks.
	09.05 Explain types of application attacks.
	09.06 Analyze a scenario and select the appropriate type of mitigation and deterrent techniques.
	09.07 Given a scenario, use appropriate tools and techniques to discover security threats and vulnerabilities.
	09.08 Explain the proper use of penetration testing versus vulnerability scanning.
10.0	Demonstrate Use of Application, Data and Host Security. The student will be able to:
	10.01 Explain the importance of application security controls and techniques.
	10.02 Summarize mobile security concepts and technologies.
	10.03 Given a scenario, select the appropriate solution to establish host security.
	10.04 Implement the appropriate controls to ensure data security.
	10.05 Compare and contrast alternative methods to mitigate security risks in static environments.
11.0	Demonstrate proficiency and understanding of Access Control and Identity Management. The student will be able to:
	11.01 Compare and contrast the function and purpose of authentication services (RADIUS, TACACAS+, LDAP).
	11.02 Given a scenario, select the appropriate authentication, authorization or access control.
	11.03 Install and configure security controls when performing account management, based on best practices.
12.0	Demonstrate proficiency and understanding in Cryptography. The student will be able to:
	12.01 Given a scenario, utilize general cryptography concepts.
	12.02 Given a scenario, use appropriate cryptographic methods.
	12.03 Given a scenario, use appropriate PKI, certificate management and associated components.
13.0	Demonstrate use of Ethical Hacking. The student will be able to:
	13.01 Demonstrate security fundamentals.

	13.02 Perform security testing.
	13.03 Differentiate between hackers and crackers.
	13.04 Identify ethical hackers.
	13.05 Explain and implement testing plans.
	13.06 Demonstrate proficiency with ethics and legality.
14.0	Demonstrate proficiency in understanding the technical foundations of hacking. The student will be able to:
	14.01 Explain the Attacker's process.
	14.02 Explain the ethical hacker process.
	14.03 Compare the relationship between security and the OSI model.
15.0	Demonstrate an understanding of foot printing and scanning. The student will be able to:
	15.01 Explain the seven-step information gathering process.
	15.02 Identify active machines.
	15.03 Demonstrate proficiency in finding open ports and access points.
	15.04 Demonstrate use of OS fingerprinting.
	15.05 Demonstrate proficiency in mapping the network attack surface.
16.0	Demonstrate proficiency and understanding of enumeration and system hacking. The student will be able to:
	16.01 Define enumeration.
	16.02 Demonstrate proficiency in system hacking.
17.0	Demonstrate proficiency Linux and automated assessment tools. The student will be able to:
	17.01 Manage Linux OS.
	17.02 Demonstrate proficiency in hacking Linux.
	17.03 Demonstrate proficiency in hardening Linux.
	17.04 Explain use of automated exploit tools.
18.0	Demonstrate understanding of Trojans and backdoors. The student will be able to:
	18.01 Explain the characteristics of Trojans.
	18.02 Demonstrate proficiency in covert communication.
	18.03 Explain keystroke logging and spyware characteristics.

	18.04 Demonstrate understanding and proficiency in Trojan and backdoor countermeasures.
19.0	Demonstrate understanding of Sniffers, session hijacking, and denial of service. The student will be able to:
	19.01 Explain the functions and types of sniffers.
	19.02 Explain session hijacking.
	19.03 Demonstrate understanding of DoS, DDoS and Botnets.
20.0	Demonstrate understanding and proficiency in web server hacking, web application and database attack. The student will be able to:
	20.01 Explain webserver hacks.
	20.02 Explain web application hacking.
	20.03 Explain database hacking.
21.0	Demonstrate understanding and proficiency in wireless technologies, mobile security and attacks. The student will be able to:
	21.01 Explain different wireless technologies and attacks.
	21.02 Understand and explain different wireless LANs technologies.
22.0	Demonstrate understanding and proficiency in configuring IDS, Firewalls, and Honeypots. The student will be able to:
	22.01 Explain and configure different types of IDSs.
	22.02 Explain and configure different types of firewalls.
	22.03 Explain and configure different types of honeypots.
23.0	Explain use of buffer overflows, viruses, and worms. The student will be able to:
	23.01 Explain buffer overflows, buffer overflows attacks, and prevention.
	23.02 Define the use of viruses and worms.
24.0	Employing cryptographic attacks and defenses. The student will be able to:
	24.01 Explain functions of cryptography.
	24.02 Report the history of cryptography.
	24.03 Identify different algorithms.
	24.04 Identify digital signature.
	24.05 Explain steganography operation.
	24.06 Use steganographic tools.
	24.07 Create a digital watermark.

	24.08 Use digital certificates.
	24.09 Explain public key infrastructure.
	24.10 Define protocols, standards, and applications.
	24.11 Use encryption-cracking tools.
25.0	Demonstrate use of physical security and social engineering. The student will be able to:
	25.01 Apply physical security measures.
	25.02 Define social engineering types, attacks and preventive measures.
Course Number: CTS0094 Occupational Completion Point: B Interconnecting Cisco Network Devices - 600 Hours	
26.0	Describe the operation of data networks. The student will be able to:
	26.01 Recognize the purpose and functions of various network devices such as routers, switches, bridges and hubs.
	26.02 Select the components required to meet a given network specification.
	26.03 Identify common applications and their impact on the network.
	26.04 Describe the purpose and basic operation of the protocols in the OSI and TCP/IP models.
	26.05 Predict the data flow between two hosts across a network.
	26.06 Identify the appropriate media, cables, ports, and connectors to connect Cisco network devices to other network devices and hosts in a LAN.
27.0	Demonstrate proficiency in LAN Switching Technologies. The student will be able to:
	27.01 Determine the technology and media access control method for Ethernet networks.
	27.02 Identify basic switching concepts and the operation of Cisco switches.
	27.03 Configure and verify initial switch configuration including remote access management.
	27.04 Describe how VLANs create logically separate networks and the need for routing between them.
	27.05 Configure and verify VLANs.
	27.06 Configure and verify trunking on Cisco switches.
28.0	Understand, IP addressing (IPv4/IPv6). The student will be able to
	28.01 Describe the operation and necessity of using private and public IP addresses for IPv4 addressing.
	28.02 Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment.

	28.03 Identify the appropriate IPv4 addressing scheme using VLSM and summarization to satisfy addressing requirements in a LAN/WAN environment.
	28.04 Describe the technological requirements for running IPv6 in conjunction with IPv4.
	28.05 Describe IPv6 addresses.
29.0	Demonstrate proficiency in IP Routing Technologies. The student will be able to:
	29.01 Describe basic routing concepts.
	29.02 Configure and verify utilizing the CLI to set basic Router configuration.
	29.03 Configure and verify operation status of an Ethernet interface.
	29.04 Verify router configuration and network connectivity using.
	29.05 Configure and verify routing configuration for a static or default route given specific routing requirements.
	29.06 Differentiate methods of routing and routing protocols.
	29.07 Configure and verify OSPF (single area).
	29.08 Configure and verify interVLAN routing (router on a stick).
	29.09 Configure SVI interfaces.
30.0	Demonstrate proficiency in IP Services. The student will be able to:
	30.01 Configure and verify DHCP (IOS router).
	30.02 Describe the types, features, and applications of ACLs.
	30.03 Configure and verify ACLs in a network environment.
	30.04 Identify the basic operation of NAT.
	30.05 Configure and verify NAT for given network requirements.
	30.06 Configure and verify NTP as a client.
31.0	Demonstrate proficiency in Network Device Security. The student will be able to:
	31.01 Configure and verify network device security features.
	31.02 Configure and verify switch port security.
	31.03 Configure and verify ACLs to filter network traffic.
	31.04 Configure and verify ACLs to limit telnet and SSH access to the router.
32.0	Demonstrate proficiency in Troubleshooting VLANs, Trunking and ACLs. The student will be able to:
	32.01 Troubleshoot and correct common problems associated with IP addressing and host configurations.

	32.02 Troubleshoot and resolve VLAN problems.
	32.03 Troubleshoot and resolve trunking problems on Cisco switches.
	32.04 Troubleshoot and resolve ACL issues.
33.0	Demonstrate proficiency in LAN Switching Technologies. The student will be able to:
	33.01 Identify enhanced switching technologies (RSTP, PRSTP, VSTP, Etherchannels).
	33.02 Configure and verify PVSTP operation.
34.0	Demonstrate proficiency in IP Routing Technologies. The student will be able to:
	34.01 Describe the boot process of Cisco IOS routers.
	34.02 Configure and verify the operation status of a serial interface.
	34.03 Manage Cisco IOS files.
	34.04 Differentiate methods of routing and routing protocols.
	34.05 Configure and verify OSPF (multi-area).
	34.06 Configure and verify EIGRP (single AS).
	34.07 Passive Interface.
35.0	Demonstrate proficiency in IP Services. The student will be able to:
	35.01 Recognize high availability (FHRP).
	35.02 Configure and verify syslog.
36.0	Demonstrate proficiency in troubleshooting network problems. The student will be able to:
	36.01 Identify and correct common network problems.
	36.02 Utilize netflow data.
	36.03 Troubleshoot and resolve spanning tree operation issues.
	36.04 Troubleshoot and resolve routing issues.
	36.05 Troubleshoot and resolve OSPF problems.
	36.06 Troubleshoot and resolve EIGRP problems.
	36.07 Troubleshoot and resolve inter VLAN routing problems.
	36.08 Troubleshoot and resolve WAN implementation issues.
	36.09 Monitor NetFlow statistics.

	36.10 TS etherchannel problems.
37.0	Demonstrate proficiency in WAN Technologies. The student will be able to:
	37.01 Identify different WAN Technologies.
	37.02 Configure and verify a basic WAN serial connection.
	37.03 Configure and verify a PPP connection between Cisco routers.
	37.04 Configure and verify Frame Relay on Cisco routers.
	37.05 Implement and troubleshoot PPPoE.
Course Number: CTS0048 Occupational Completion Point: B Microsoft Certified Systems Administrator – 600 Hours	
38.0	Demonstrate knowledge and skills in installing and configuring servers. The student will be able to:
	38.01 Plan for a server installation, plan for server roles, plan for a server upgrade, install Server Core, optimize resource utilization by using Features on Demand, migrate roles from previous versions of Windows Server.
	38.02 Design and configure storage solutions.
39.0	Demonstrate knowledge and skills in configuring server roles and features. The student will be able to:
	39.01 Create and configure shares and share permissions.
	39.02 Configure and manage print services.
	39.03 Configure WinRM, configure down-level server management, configure servers for day-to-day management tasks, configure multi-server management, configure Server Core, configure Windows Firewall, manage non-domain joined servers.
40.0	Demonstrate knowledge and skills in configuring Hyper-V. The student will be able to:
	40.01 Create and configure virtual machine settings.
	40.02 Create and configure virtual machine storage.
	40.03 Create and configure virtual networks.
41.0	Demonstrate knowledge and skills in deploying and configuring core network services. The student will be able to:
	41.01 Configure IPv4 and IPv6 addressing.
	41.02 Deploy and configure Dynamic Host Configuration Protocol (DHCP) service.
	41.03 Deploy and configure DNS service.
	41.04 Configure Active Directory integration of primary zones, configure forwarders, configure Root Hints, manage DNS cache, create A and PTR resource records.

42.0	Demonstrate knowledge and skills in installing and administering active Directory. The student will be able to:
42.01	Install and configure domain controllers.
42.02	Create and manage Active Directory users and computers.
42.03	Create and manage Active Directory groups and organizational units (OUs).
43.0	Demonstrate knowledge and skills in creating and managing Group Policy. The student will be able to:
43.01	Create and configure Group Policy objects (GPOs).
43.02	Configure security policies.
43.03	Configure application restriction policies.
43.04	Configure Windows Firewall.
44.0	Demonstrate knowledge and skills in administering Windows Server. The student will be able to:
44.01	Deploy and manage server images.
44.02	Install and configure the Windows Server Update Services (WSUS) role.
44.03	Configure Data Collector Sets (DCS).
44.04	Configure file and print services (DFS).
44.05	Configure file and disk encryption.
44.06	Configure network services and access.
44.07	Configure DNS zones and records.
44.08	Configure virtual private network (VPN) and routing.
44.09	Configure DirectAccess: Implement server requirements, implement client configuration, configure DNS for Direct Access, configure certificates for Direct Access.
44.10	Configure a Network Policy Server (NPS) infrastructure and policies.
44.11	Configure Network Access Protection (NAP).
45.0	Demonstrate knowledge and skills in configuring Advanced Windows Server Services. The student will be able to:
45.01	Configure and manage high availability.
45.02	Configure failover clustering.
45.03	Configure file and storage solutions (Network File System, FSRM).
45.04	Implement business continuity and disaster recovery (Backups, Fault Tolerance).
45.05	Configure Advanced Network services (DHCP, DNS, IPAM).

45.06	Configure the Active Directory Infrastructure (Forests, Multi-Domain).
45.07	Configure Identity Access Solutions (AD FS, AD CS, CA).
45.08	Manage certificates.
45.09	Install and configure Active Directory Rights Management Services (AD RMS).
45.10	Manage and Configure System Center Configuration Manager.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computations (Mathematics) and Communication (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Enterprise Desktop and Mobile Support Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y300600	
CIP Number	0511100124	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	SkillsUSA, PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

The purpose of this program is to prepare students for employment or advanced training in a variety of occupations in the information technology industry.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the information technology industry; technical and product skills, underlying principles of technology, planning, management, finance, labor issues, community issues and health, safety, and environmental issues.

The content includes but is not limited to communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points. When the recommended sequence is followed, the structure is intended to prepare students to complete the CompTIA A+ and Network+ industry certifications. A student who completes the applicable competencies at any occupational completion point may either continue with the training or become an occupational completer.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0000	Computer Hardware Fundamentals	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G INFO TECH 7 G CYBER TECH 7 G ELECTRONIC @7 7 G	150 hours
	CTS0001	Operating System Fundamentals		150 hours
B	CTS0002	Advanced Operating Systems		150 hours
	CTS0003	Mobile-Security-Domain Environment Fundamentals		150 hours
C	CTS0005	Desktop Support Technician		150 hours
D	CTS0020	Network Fundamentals		150 hours
	CTS0033	Network Technician		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Identify characteristics of medium size enterprise information systems as a business unit and its critical role and purpose in successful and efficient business operation.
02.0 Demonstrate proficiency using enterprise-class computer/devices connectors, jacks, plugs, cables and their function, versions and purpose.
03.0 Demonstrate proficiency with motherboards, CPU options, system components, BIOS types and BIOS-UEFI configurations options.
04.0 Demonstrate proficiency with tools, ESD concepts-procedures, personal and equipment safety and chemicals related to maintenance and repair of computers, mobile devices, peripherals, printers and network devices.
05.0 Demonstrate an understanding of storage, video, audio, display, and network-cellular found in the business/enterprise.
06.0 Demonstrate proficiency in building a basic PC system using standard components, following best practices in equipment and personal safety, following manufactures' procedures and steps for every component involved in the system.
07.0 Demonstrate proficiency with installation and configuration of enterprise desktop-laptop operating systems.
08.0 Demonstrate proficiency installing and configuring expansion cards, RAM, storage devices, video adapters, audio, and a variety of system components.
09.0 Demonstrate proficiency in installing, updating and troubleshooting drivers in desktop-laptop-tablet devices.
10.0 Demonstrate proficiency with PC Laptop specification for purchase–Laptop systems for a variety of corporate functions such as, basic desktop user, CAD, CAE, video-audio editing and client-side virtualization.
11.0 Demonstrate the importance of health, safety, and environmental procedures in organizations and their importance to organizational and personal performance and regulatory compliance.
12.0 Demonstrate proficiency in connecting, configuring and troubleshooting multi-displays, data projectors, smart boards, and document cameras and kiosks systems.
13.0 Demonstrate proficiency of installing, configuring and troubleshooting enterprise desktop-laptop operating systems in a network environment.
14.0 Demonstrate proficiency of installing and configuring and troubleshooting variety of business applications in a network environment.
15.0 Demonstrate proficiency in configuring and troubleshooting basic desktop, laptop network connectivity, including software, services, cables, switches, and access points.
16.0 Understanding the fundamentals of active directory domains, organization units, the role of computers and users in that environment and how the technician interacts with this secure environment.
17.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
18.0 Describe the importance of professional ethics and legal responsibilities.
19.0 Explain and demonstrate the basic features of mobile operating systems.
20.0 Establish mobile network connectivity and configure email, and applications and configure application synchronization.
21.0 Configure, compare and contrast methods for mobile security and hardware platforms.
22.0 Identify and enterprise attack vectors, remove malware, viruses, and other security risk software from desktops, laptop, and mobile devices.
23.0 Demonstrate proficiency identifying, and mitigating malicious threats using social and human elements in the workplace.
24.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
25.0 Identify and compare and contrast business type printers.
26.0 Install, configure and troubleshooting directly connected printers and share to the local network.

27.0 Install, configure and troubleshooting server-based printers and validate the clients printing functionality.
28.0 Demonstrate command-line fundamentals, including hard drive navigation, network tools, basic scripts and the fundamentals of PowerShell.
29.0 Demonstrate proficiency in share permissions and file and folder security including fundamentals of domain users, local users, groups in an active directory environment.
30.0 Demonstrate the fundamentals of network architectural structure of LANs, fundamentals and roles of the network switch, router and WAN.
31.0 Demonstrate proficiency in tools and equipment for troubleshooting network connectivity.
32.0 Demonstrate the use of network services including DNS, DHPC, cellular, cloud services and applications.
33.0 Demonstrate the fundamentals TCP/IP, OSI and Internet models of network layer addressing.
34.0 Setup and configure basic VoIP telephony functionality for business users.
35.0 Setup and configure VPN on desktop, tablet, and laptop platforms.
36.0 Demonstrate proficiency installing, configuring, and troubleshooting management system agents, anti-virus, group policy objects, operating systems and applications updates.
37.0 Demonstrate proficiency in installing, configuring and troubleshooting client-side virtualization.
38.0 Demonstrate proficiency with different operating systems.
39.0 Demonstrate proficiency of user data backup, configuration, and recovery.
40.0 Demonstrate troubleshooting of PC and laptop hardware failures.
41.0 Demonstrate troubleshooting of PC-laptop boot failures, BSOD, shutdown, devices failing to start, missing DLL message.
42.0 Describe the operation of data networks.
43.0 Differentiate between various network media and topologies.
44.0 Identify, install, and configure basic network devices.
45.0 Implement an IP addressing scheme to meet network requirements.
46.0 Demonstrate use of network management tasks and methodologies.
47.0 Demonstrate proficiency using basic network tools.
48.0 Demonstrate an understanding of network security threats and mitigation techniques.
49.0 Configure, verify and troubleshoot a switch with VLANs and interswitch communications.
50.0 Implement an IP addressing scheme and IP Services to meet network requirements in a medium-size Enterprise branch office network.
51.0 Understand basic router operation.
52.0 Demonstrate Proficiency with configuring and troubleshooting a WLAN.
53.0 Demonstrate Proficiency with configuring and troubleshooting a Server.
54.0 Demonstrate Proficiency with configuring and troubleshooting a VPN.
55.0 Demonstrate Proficiency with configuring and troubleshooting a VOIP.
56.0 Demonstrate Proficiency with configuring and troubleshooting Virtualization.

Florida Department of Education
Student Performance Standards

Program Title: Enterprise Desktop and Mobile Support Technology
Career Certificate Program Number: Y300600

Course Number: CTS0000 **Occupational Completion Point: A** **Computer Hardware Fundamentals – 150 Hours**	
01.0	Identify characteristics of medium size enterprise information systems as a business unit and its critical role and purpose in successful and efficient business operation. The student will be able to:
01.01	Identify business unit structures (operations, accounting) in most medium and large enterprise.
01.02	Describe the relationship between enterprise business units and IT unit.
01.03	Summarize various career options within the IT enterprise (Help Desk, Tier 1, Tier 2, Server Administrator).
01.04	Analyze and report on IT budgets, project management, IT services, and IT innovation.
01.05	Evaluate and justify the role and importance of IT within medium and large enterprise companies.
02.0	Demonstrate proficiency using enterprise-class computer/devices connectors, jacks, plugs, cables and their function, versions and purpose. The student will be able to:
02.01	Identify legacy and current technology connectors, jacks and cables for PCs, tablets, laptops and smart phones.
02.02	Determine function and identify versions of connectors, jacks and plugs on enterprise type motherboards, laptops, tablets and smart phones.
03.0	Demonstrate proficiency with motherboards, CPU options, system components, BIOS types and BIOS-UEFI configurations options. The student will be able to:
03.01	Classify motherboard form factors, motherboard components, types and features.
03.02	Classify internal power supplies types, characteristics and connectors.
03.03	Explain the purpose CPUs, characteristics and features.
03.04	Compare and contrast CPU cooling technology for components and devices.
03.05	Compare and contrast memory types, characteristics and purpose.
03.06	Identify and explain the functions of internal storage technologies.
03.07	Compare features of BIOS vs UEFI as related to advanced functionality and security.
03.08	Identify and explain the importance of TPM and hardware-based security in enterprise devices.
03.09	Demonstrate firmware upgrades, device tracking configuration, and password protection of devices.
04.0	Demonstrate proficiency with tools, ESD concepts-procedures, personal and equipment safety and chemicals related to maintenance and

	repair of computers, mobile devices, peripherals, printers and network devices. The student will be able to:
	04.01 Given a scenario use the appropriate tools in the repair and maintenance of desktops.
	04.02 Demonstrate personal safety procedures during the repair of electronic equipment, proper battery handling and storage.
	04.03 Demonstrate use of ESD protection including: wrist straps, ESD mats, self-grounding, and equipment grounding.
	04.04 Describe chemical SDS forms, demonstrate how to implement safety procedures, and demonstrate steps emergency aid in the event of mistakes in the use of the chemical.
	04.05 Identify tools and appropriate use of tools in the repair of mobile devices, peripherals, printers and network devices.
05.0	Demonstrate an understanding of storage, video, audio, display, and network-cellular found in the business/enterprise. The student will be able to:
	05.01 Identify and explain the purpose of storage types, technologies and proper implementation of storage types and technology in the support of enterprise users. SATA, SATA express, SAS, SCSI, NVMe, SSD Hard Drive, Hybrid Hard Drives, Spindle-based Hard Drives, Flash-based storage, SD, RAID technologies, Cloud-based storage options, Optical based storage.
	05.02 Identify common video display technologies describe use/implementation in enterprise.
	05.03 Identify common audio technologies and describe the use/implementation in enterprise.
	05.04 Identify common display technologies describe the use/implementation in enterprise. Multi-displays, LCD, LED, OLED.
	05.05 Identify common network-cellular technologies and describe the use/implementation in enterprise. WiFi 802.11x, Wired Ethernet, Cellular technologies, Bluetooth, RFID, NFC.
06.0	Demonstrate proficiency in building a basic PC system using standard components, following best practices in equipment and personal safety, following manufactures' procedures and steps for every component involved in the system. The student will be able to:
	06.01 Demonstrate the ability to read and understand OEM technical documentation, manuals, diagrams and procedures.
	06.02 Demonstrate proper handling and installation of CPU, motherboard, adapters, and power supplies in the PC enclosure/case.
	06.03 Demonstrate understanding of thermal monitoring, stress testing of components, and benchmarks for performance.
	06.04 Demonstrate installation of a basic operating system on a storage device.
Course Number: CTS0001 Occupational Completion Point: A Operating System Fundamentals – 150 Hours	
07.0	Demonstrate proficiency with installation and configuration of enterprise desktop-laptop operating systems. The student will be able to:
	07.01 Demonstrate the technology and procedures for network-based, flash drive, and image-based operating system installs.
	07.02 Demonstrate the creation and use of answer-file based operating systems installs using either network file shares or flash drives.
	07.03 Demonstrate installation of operating systems using sysprep, cloning software and basic scripts to do basic configurations.
08.0	Demonstrate proficiency installing and configuring expansion cards, RAM, storage devices, video adapters, audio, and a variety of system

	components. The student will be able to:
	08.01 Demonstrate proper procedures while following OEM documentation on the installation of variety of expansion cards.
	08.02 Demonstrate proper procedures while following OEM documentation when upgrading RAM.
	08.03 Demonstrate proper procedures while following OEM documentation when upgrading and configuring a variety of storage devices and storage configurations.
	08.04 Compare and contrast RAID scenarios used by enterprise for specialty functions (video editing, CAD, CAE).
	08.05 Demonstrate proper procedures while following OEM documentation when upgrading and configuring a variety of video adapters.
09.0	Demonstrate proficiency in installing, updating and troubleshooting drivers in desktop-laptop-tablet devices. The student will be able to:
	09.01 Explain the purpose and function of signed drivers, compare generic drivers with OEM drivers and properly choose the correct one given any scenario.
	09.02 Demonstrate proficiency with installing configuring, troubleshooting and updating device drivers in desktops, laptops, and other mobile devices.
10.0	Demonstrate proficiency with PC Laptop specification for purchase–Laptop systems for a variety of corporate functions such as, basic desktop user, CAD, CAE, video-audio editing and client-side virtualization. The student will be able to:
	10.01 Properly select display adapters, CPU, storage needs, audio functionally, and motherboard for CAD and CAE workstations and laptops.
	10.02 Properly select display adapters, CPU, storage needs, audio functionally, and motherboard for video-audio editing workstations and laptops.
	10.03 Properly select display adapters, CPU, storage needs, audio functionally, and motherboard for client-side virtualization workstations and laptops.
11.0	Demonstrate the importance of health, safety, and environmental procedures in organizations and their importance to organizational and personal performance and regulatory compliance. The student will be able to:
	11.01 Demonstrate knowledge of the business procedures and processes for appropriate personal and equipment safety within the workspace.
	11.02 De-energizing equipment, tag-out procedures, lifting techniques, weight limitations, electrical fire safety, removal of personal jewelry.
	11.03 Demonstrate knowledge of business and security procedures for disposal of any storage device with corporate or personal data on it.
	11.04 Demonstrate knowledge of procedures for disposal of any electronic device, batteries, chemicals that meet local, state and federal compliance regulations.
12.0	Demonstrate proficiency in connecting, configuring and troubleshooting multi-displays, data projectors, smart boards, and document cameras and kiosks systems. The student will be able to:
	12.01 Demonstrate proper procedures and steps, following OEM documentation, while connecting, configuring and troubleshooting multi-display systems.
	12.02 Demonstrate proper procedures and steps, following OEM documentation, while connecting, configuring and troubleshooting data-projector systems.
	12.03 Demonstrate proper procedures and steps, following OEM documentation, while connecting, configuring and troubleshooting smart boards systems.

12.04	Demonstrate proper procedures and steps, following OEM documentation, while connecting, configuring and troubleshooting kiosk systems.
12.05	Demonstrate proper procedures and steps, following OEM documentation, while connecting, configuring and troubleshooting document camera systems.
Course Number: CTS0002 Occupational Completion Point: B Advanced Operating Systems – 150 Hours	
13.0	Demonstrate proficiency of installing, configuring and troubleshooting enterprise desktop-laptop operating systems in a network environment. The student will be able to:
13.01	Describe the configuration and setup of network-based operating systems installation, flash drive installation and imaging.
13.02	Demonstrate the installation of an operating system using answer files, sysprep, clone tools and basic scripts for configuration.
13.03	Demonstrate understanding of users and groups configurations, management agents, and user's rights for enterprise desktops and laptops.
13.04	Demonstrate built-in operating system utilities for configuring and managing services, devices, performance, and disks.
13.05	Demonstrate built-in operating system utilities for configuring and managing scheduled tasks.
13.06	Demonstrate built-in operating system utilities user configuration, registry modification, user migration, system configuration and local security policies.
13.07	Employ built-in operating system administrative utilities for configuration and troubleshooting.
13.08	Explain operating system processes, threads, DLLs, security, and parent child relationships within the operating system.
13.09	Troubleshoot locked processes, processes that demand excessive resources, and processes that may need updates or developer intervention.
13.10	Remotely troubleshoot operating systems using RDC, built-in utilities, and web-based remote access tools.
13.11	Demonstrate the bare-metal backup and recovery on an operating system.
14.0	Demonstrate proficiency of installing and configuring and troubleshooting variety of business applications in a network environment. The student will be able to:
14.01	Demonstrate the proper installation of typical user applications.
14.02	Demonstrate basic scripting during the installation of typical applications.
14.03	Demonstrate troubleshooting steps and procedures for typical business applications, including desktop apps, modern apps, and cloud-based applications.
14.04	Compare and explain the differences and similarities of desktop applications, modern applications and cloud-based applications.
15.0	Demonstrate proficiency in configuring and troubleshooting basic desktop, laptop network connectivity, including software, services, cables, switches, and access points. The student will be able to:
15.01	Describe the characteristics and identify various network cables and connectors used in the enterprise.

	15.02 Compare wireless standards and configurations needed for accessing APs.
	15.03 Describe the fundamentals of an Ethernet based LAN, the role of switches in user connectivity to the LAN.
	15.04 Identify fundamental services and key components for networking in the operating system.
	15.05 Explain static and dynamic IP addressing, and fundamentals of network connectivity between switches and NICs, wireless NICs and access points.
	15.06 Configure and troubleshoot basic network connectivity for both desktops and laptops to wired and wireless network connection.
16.0	Understanding the fundamentals of active directory domains, organization units, the role of computers and users in that environment and how the technician interacts with this secure environment. The student will be able to:
	16.01 Explain the fundamental structure, purpose and function of active directory.
	16.02 Explain the purpose and relationship of domain users and groups and computer membership in a domain environment.
	16.03 Join computers to a domain, add domain users to local groups and explain the impact on the operating system and user rights.
	16.04 Given a user, business need, and security requirement show how GPOs impact the function of the operating system.
	16.05 Given a scenario apply a GPO to users and computers that effectively meets the criteria of the scenario.
17.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. The student will be able to:
	17.01 Describe the nature and types of business organizations.
	17.02 Explain the effect of key organizational systems on performance and quality.
	17.03 List and describe quality control systems and/or practices common to the workplace.
	17.04 Explain the impact of the global economy on business organizations.
18.0	Describe the importance of professional ethics and legal responsibilities. The student will be able to:
	18.01 Evaluate and justify decisions based on ethical reasoning.
	18.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	18.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	18.04 Interpret and explain written organizational policies and procedures.
Course Number: CTS0003 Occupational Completion Point: B Mobile-Security-Domain Environment Fundamentals – 150 Hours	
19.0	Explain and demonstrate the basic features of mobile operating systems. The student will be able to:
	19.01 Compare and contrast the significant mobile operating systems as open source vs vendor specific, its impact on applications

		sources, it fundamental operations and interface.
	19.02	Explain the various enterprise BYOD policies found in the local area, their impact on the user and security policies of company data.
	19.03	Demonstrate the ability to navigate and locate administration functionality on different hardware platforms and different operating systems.
20.0		Establish mobile network connectivity and configure email, and applications and configure application synchronization. The student will be able to:
	20.01	Configure fundamental settings for a user from a default state on a mobile operating system.
	20.02	Add, configure and troubleshoot mobile applications.
	20.03	Enable, configure and troubleshoot Bluetooth, NFC, wireless and cellular networks.
	20.04	Configure synchronization with email systems and other critical business type applications and cloud-based providers.
	20.05	Configure VPN for mobile devices.
21.0		Configure, compare and contrast methods for mobile security and hardware platforms. The student will be able to:
	21.01	Compare and contrast security methods for different operating systems and hardware.
	21.02	Compare and contrast security methods for Passcode locks.
	21.03	Compare and contrast security methods for Log on security methods.
	21.04	Compare and contrast security methods for Remote wipes.
	21.05	Compare and contrast security methods for Locator applications.
	21.06	Compare and contrast security methods for Patching/OS updates.
	21.07	Configure various types of user and device security on mobile operating systems.
22.0		Identify and enterprise attack vectors, remove malware, viruses, and other security risk software from desktops, laptop, and mobile devices. The student will be able to:
	22.01	Compare contrast common security threats.
	22.02	Explain the use of malware, rootkits, phishing, shoulder surfing, spyware, app vulnerability.
	22.03	Install and configure anti-virus and anti-malware software.
	22.04	Implement security best practices.
	22.05	Demonstrate setting strong passwords, changing default user names/passwords, disabling unused users, restricting user rights.
	22.06	Demonstrate safe storage device sanitation: wipe, physical destruction, out-source for recycle and sanitation.
	22.07	Establish and configure strong wireless security standards.
	22.08	Using third party tools both installed and offline, detect malicious code and remove such code, using proper procedures for protecting user data.

23.0	Demonstrate proficiency identifying, and mitigating malicious threats using social and human elements in the workplace. The student will be able to:
	23.01 Identify and implement physical security prevention methods.
	23.02 Explain access control, physical document securing, tailgating, biometrics, badges, key fobs, privacy filters and retinal identification.
	23.03 Explain the importance of “principle of least privilege” and “user education” in the overall company security policy.
	23.04 Identify the “human” element within each company and the principles behind social engineered attacks.
	23.05 Assess digital security.
	23.06 Setup firewall, anti-virus, network access policies, user authentication, directory permissions.
	23.07 Given a social engineered attack scenario, use proper procedures to identify the threat and mitigate the threat.
24.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. The student will be able to:
	24.01 Employ leadership skills to accomplish organizational goals and objectives.
	24.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	24.03 Conduct and participate in meetings to accomplish work tasks.
	24.04 Employ mentoring skills to inspire and teach others.
25.0	Identify and compare and contrast business type printers. The student will be able to:
	25.01 Explain the principles of the xerographic process used by all laser and copy devices.
	25.02 Compare and contrast the impact, thermal, and inkjet printer technologies.
	25.03 Compare and contrast types of paper used by a variety of business type printers.
26.0	Install, configure and troubleshooting directly connected printers and share to the local network. The student will be able to:
	26.01 Install, configure and troubleshoot typical MFP printers to a local host.
	26.02 Demonstrate setup for printing, fax, copy and scan.
	26.03 Install and configure a printer via, wireless, and connect mobile apps for control of printer/scanner functions.
	26.04 Perform basic printer maintenance.
	26.05 Share and secure hosted printers and troubleshoot printer and network connectivity issues.
27.0	Install, configure and troubleshooting server-based printers and validate the clients printing functionality. The student will be able to:
	27.01 Install, configure and troubleshoot server-hosted printer.
	27.02 Configure basic printer security and policies and user access.
	27.03 Connect and configure and test client access and functionality to printer.

Course Number: CTS0005 **Occupational Completion Point: C** **Desktop Support Technician – 150 Hours**	
28.0	Demonstrate command-line fundamentals, including hard drive navigation, network tools, basic scripts and the fundamentals of PowerShell. The student will be able to:
	28.01 Demonstrate hard drive and directory navigation with command-line and PowerShell.
	28.02 Demonstrate basic utilities for managing files, folders, operating system and network using command-line or PowerShell interfaces.
	28.03 Setup logon and logoff scripts and basic use of various types of scripts to manage desktops.
29.0	Demonstrate proficiency in share permissions and file and folder security including fundamentals of domain users, local users, groups in an active directory environment. The student will be able to:
	29.01 Demonstrate the fundamentals of shares and share permissions, file and folder security and the interaction between the two.
	29.02 Demonstrate the fundamentals of users and groups in their role of share permissions and file and folder security.
	29.03 Given a scenario, properly configure and set share, file and folder security for users and group combinations.
30.0	Demonstrate the fundamentals of network architectural structure of LANs, fundamentals and roles of the network switch, router and WAN. The student will be able to:
	30.01 Explain the basic structure of extended star Ethernet LANs, identify the MDF and IDF roles.
	30.02 Explain the ISP/WAN connectivity, devices and basic security structure.
	30.03 State the role of the router.
	30.04 State the role of switches, VLANs, PoE and switch interconnection in a basic LAN.
	30.05 Explain the fundamentals network devices and their functions.
	30.06 Define NAS, Bridge, Modem, router, firewall.
31.0	Demonstrate proficiency in tools and equipment for troubleshooting network connectivity. The student will be able to:
	31.01 Use a variety of tools for network cables and connectors and punch downs.
	31.02 Use cable tone and probe tools.
	31.03 Use loopback adapters for troubleshooting and various network adapters for cable crossovers.
32.0	Demonstrate the use of network services including DNS, DHPC, cellular, cloud services and applications. The student will be able to:
	32.01 Explain fundamental LAN network services: DNS, DHCP, and WINS.
	32.02 Explain the fundamentals of cellular systems and their role in network and application connectivity.
	32.03 Explain the fundamentals of cloud services and applications.

33.0	Demonstrate the fundamentals TCP/IP, OSI and Internet models of network layer addressing. The student will be able to:
	33.01 Explain the fundamentals of the OSI and Internet models.
	33.02 Explain and understand IPv4 classic addressing schemes and IPv6.
	33.03 Explain the purpose of common TCP and UDP ports, protocols.
	33.04 Explain the fundamentals of desktop-mobile use of TCP/IP configurations.
34.0	Setup and configure basic VoIP telephony functionality for business users. The student will be able to:
	34.01 Explain the fundamentals of telephony and transition of that technology to VoIP.
	34.02 List and describe the major components of user setup, basic configuration using VoIP.
	34.03 Successfully configure a basic VoIP user, test the circuit for functionality.
35.0	Setup and configure VPN on desktop, tablet, and laptop platforms. The student will be able to:
	35.01 Explain and compare the different technology and security used by VPN in the enterprise.
	35.02 Configure and test a VPN client on a desktop, tablet or laptop.
	35.03 Configure and test a public cloud-based VPN system.
36.0	Demonstrate proficiency installing, configuring, and troubleshooting management system agents, anti-virus, group policy objects, operating systems and applications updates. The student will be able to:
	36.01 Explain the purpose enterprise management systems, both local and cloud-based.
	36.02 Explain enterprise anti-malware systems and the agents critical to their success.
	36.03 Explain the purpose of domain GPOs in the overall strategy for policy and security of the network.
	36.04 Explain the control of application and operating system updates.
	36.05 Demonstrate installing configuring and troubleshooting management agents, anti-malware, GPOs, and updates.
37.0	Demonstrate proficiency in installing, configuring and troubleshooting client-side virtualization. The student will be able to:
	37.01 Identify hardware and software requirements for client-side virtualization.
	37.02 Install type 1 and type 2 hypervisors on desktop operating systems.
	37.03 Install, configure, and troubleshoot guest operating systems.
38.0	Demonstrate proficiency with different operating systems. The student will be able to:
	38.01 Compare and contrast Windows, Linux and the MAC OS.
	38.02 Explain the use and purpose of different operating systems within an enterprise.
	38.03 Identify the certifications and skills needed to support different operating systems.

	38.04 Compare the technical support challenges of different operating systems within a company.
39.0	Demonstrate proficiency of user data backup, configuration, and recovery. The student will be able to:
	39.01 Explain the fundamentals of user profiles and user data redirection.
	39.02 Properly migrate a user's data and settings from one platform to another.
	39.03 Troubleshoot user profiles issues.
	39.04 Demonstrate user data recovery and backup.
40.0	Demonstrate troubleshooting of PC and laptop hardware failures. The student will be able to:
	40.01 Troubleshoot a variety of hardware failures.
	40.02 Troubleshoot hard drive, RAID issues, cable connections, adapter, overheating, and power supply and motherboard and monitor.
41.0	Demonstrate troubleshooting of PC-laptop boot failures, BSOD, shutdown, devices failing to start, missing DLL message. The student will be able to:
	41.01 Troubleshoot a variety of boot and shutdown failures.
	41.02 Troubleshoot BSOD, operating system errors message, device and services failing to start, missing DLLs.
Course Number: CTS0020 Occupational Completion Point: D Networking Fundamentals– 150 Hours	
42.0	Describe the operation of data networks. The student will be able to:
	42.01 Explain the function of common networking protocols.
	42.02 Identify commonly used TCP and UDP default ports.
	42.03 Identify address formats- IPv4, IPv6, MAC address.
	42.04 Explain the function of each layer of the OSI model.
	42.05 Identify the proper use of addressing technologies and addressing schemes.
	42.06 Identify common routing protocols.
	42.07 Explain the purpose and properties of routing.
	42.08 Compare the characteristics of wireless communication standards.
	42.09 Interpret network diagrams.
43.0	Differentiate between various network media and topologies. The student will be able to:
	43.01 Categorize standard cable types and their properties.

	43.02 Identify common connector types.
	43.03 Identify common physical network topologies.
	43.04 Differentiate and implement appropriate wiring standards.
	43.05 Select the appropriate media, cables, ports, and connectors to connect network devices.
	43.06 Categorize WAN technology types and properties.
	43.07 Categorize LAN technology types and properties.
	43.08 Explain common logical network topologies and their characteristics.
	43.09 Install components of wiring distribution.
	43.10 Build appropriate cables.
	43.11 Troubleshoot common network cabling issues.
44.0	Identify, install, and configure basic network devices. The student will be able to:
	44.01 Install, configure and differentiate between common network devices.
	44.02 Identify the functions of specialized network devices.
	44.03 Explain the advanced features of a switch.
	44.04 Implement a small switched network.
	44.05 Verify network status and operation using basic utilities.
45.0	Implement an IP addressing scheme to meet network requirements. The student will be able to:
	45.01 Assign and verify valid IP addresses in a LAN environment.
	45.02 Describe Network Address Translation (NAT) and its importance in network communication.
	45.03 Distinguish between public and private IP addresses.
	45.04 Configure, verify, and troubleshoot DHCP and DNS operation.
	45.05 Implement static and dynamic IP addressing.
	45.06 Troubleshoot IP addressing issues.
46.0	Demonstrate use of network management tasks and methodologies. The student will be able to:
	46.01 Explain network segmentation and traffic management concepts.
	46.02 Conduct network monitoring to identify performance and connectivity issues.
	46.03 Implement network troubleshooting methodologies.

	46.04 Troubleshoot common connectivity issues and select an appropriate solution.
47.0	Demonstrate proficiency using basic network tools. The student will be able to:
	47.01 Select the appropriate command line interface tool and interpret the output to verify functionality.
	47.02 Explain the purpose of network scanners.
	47.03 Utilize the appropriate hardware tools.
48.0	Demonstrate an understanding of network security threats and mitigation techniques. The student will be able to:
	48.01 Explain the function of hardware and software security devices.
	48.02 Explain common features of a firewall.
	48.03 Explain the methods of network access security.
	48.04 Explain methods of user authentication.
	48.05 Explain issues that affect device security.
	48.06 Implement password and physical security in a small routed network.
	48.07 Identify common security threats and mitigation techniques.
Course Number: CTS0026 Occupational Completion Point: D Network Technician – 150 Hours	
49.0	Configure, verify and troubleshoot a switch with VLANs and interswitch communications. The student will be able to:
	49.01 Select the appropriate media, cables, ports, and connectors to connect switches to other network devices and hosts.
	49.02 Explain the technology and media access control method for Ethernet networks.
	49.03 Explain basic switching concepts and the operation of managed switches.
	49.04 Perform and verify switch configuration tasks.
	49.05 Verify network status and switch operation using basic utilities.
	49.06 Describe enhanced switching technologies.
	49.07 Describe how VLANs create logically separate networks and the need for routing between them.
	49.08 Configure, verify and troubleshoot VLANs.
	49.09 Implement basic switch security.
50.0	Implement an IP addressing scheme and IP Services to meet network requirements in a medium-size Enterprise branch office network. The student will be able to:

	50.01 Describe the operation and benefits of using private and public IP addressing.
	50.02 Explain the operation and benefits of using DHCP and DNS.
	50.03 Implement static and dynamic addressing services for hosts in a LAN environment.
	50.04 Calculate and apply an addressing scheme including subnetting IP networks.
	50.05 Describe the technological requirements for running IPv6 in conjunction with IPv4 (e.g., protocols, dual stack, tunneling).
	50.06 Describe IPv6 addressing.
	50.07 Implement IPv6 in a network environment.
	50.08 Identify and correct common problems associated with IP addressing and host configurations.
51.0	Understand basic router operation. The student will be able to:
	51.01 Describe basic routing concepts (e.g., packet forwarding, router lookup process).
	51.02 Describe the operation of routers.
	51.03 Select the appropriate media, cables, ports and connectors to connect routers to other network devices and hosts.
	51.04 Verify network connectivity (using ping, traceroute, telnet or SSH).
	51.05 Explain the basics of routing concepts and protocols.
	51.06 Explain the basics of Network Address Translation and Port Address Translation.
52.0	Demonstrate proficiency with configuring and Troubleshooting a WLAN. The student will be able to:
	52.01 Describe the standards associated with wireless media.
	52.02 Identify and describe the purpose of the components of a small WLAN.
	52.03 Configure a small WLAN such that devices connect to the correct access point.
	52.04 Describe the security features and capabilities of WI-FI Protected Access (WPA).
	52.05 Describe common issues with implementing a WLAN and methods for addressing these issues.
	52.06 Describe the wireless security standards.
	52.07 Implement the appropriate wireless security standard.
	52.08 Design and implement a wireless network using appropriate standards.
	52.09 Identify common issues with implementing wireless networks.
	52.10 Troubleshoot common wireless network issues.
53.0	Demonstrate proficiency with configuring and Troubleshooting a Server. The student will be able to:

	53.01 Install Server OS and select appropriate roles.
	53.02 Configure different server roles (DHCP, DNS, Print Server, File Server).
	53.03 Configure network authorization and authentication on server.
	53.04 Configure web content filtering and caching (Proxy).
	53.05 Install and apply patches and updates.
	53.06 Perform network backups and select appropriate mediums.
	53.07 Perform software deployment over the network.
54.0	Demonstrate proficiency with configuring and troubleshooting a VPN. The student will be able to:
	54.01 Describe the common protocols and ports associated with a VPN.
	54.02 Setup and configure a VPN.
	54.03 Troubleshoot common issues associated with VPN connectivity.
55.0	Demonstrate proficiency with configuring and troubleshooting a VOIP. The student will be able to:
	55.01 Explain Quality of Service and how it applies to a VOIP system.
	55.02 Describe common protocols associated with VOIP.
	55.03 Explain the main features of a Call Management System.
56.0	Demonstrate proficiency with configuring and troubleshooting Virtualization. The student will be able to:
	56.01 Setup and configure a networked virtual environment (e.g. Server Farm).
	56.02 Explain the positives and negatives of virtualization.
	56.03 Explain the different types of Storage Area Network devices.
	56.04 Explain Cloud computing and cloud storage.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.
Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Digital Media Technology**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y500100	
CIP Number	0509070200	
Grade Level	30, 31	
Program Length	750 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in technical digital media positions in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills.

The content includes but is not limited to practical experiences in the implementation, management, and maintenance of advanced telecommunication environments associated with the creation, packaging, and delivery of digital media.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	DIG0080	Digital Media Technician	BUS ED 1 @2 DIGI MEDIA 7G INFO TECH 7G	600 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Describe characteristics of digital media relative to format, standards, encoding schemes, and origin.
17.0 Compare and contrast various forms of digital media delivery systems.
18.0 Demonstrate an understanding of handling equipment, recording video and audio, exporting files and editing projects.
19.0 Demonstrate an understanding of the characteristics, development medium, and technical aspects of digital audio.
20.0 Create animation in digital media that enhances production.
21.0 Perform safety skills while performing or recording on set.
22.0 Apply appropriate lighting for location and/or set productions.
23.0 Operate a video camera.
24.0 Record, mix and edit audio resources.
25.0 Shoot Studio and /or location footage.
26.0 Design and generate graphic elements.
27.0 Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital video.
28.0 Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital audio.
29.0 Apply industry standard workflow management methods applicable to the integration and synchronization of audio and video into a single digital media product.

30.0 Apply industry standard asset management methods applicable to development of a digital media product.
31.0 Explain the importance of calibration in the production of digital media and the means by which it is accomplished.
32.0 Demonstrate proficiency in producing a digital media product for delivery for both televised and online streaming media.
33.0 Demonstrate proficiency in producing a digital media product for delivery using an Internet-based on-demand system (e.g., VOD, IPTV).
34.0 Demonstrate proficiency in producing a digital media product for delivery using an Internet-based streaming system.
35.0 Demonstrate proficiency in producing a digital media product for delivery using an Internet-based system featuring multi-point presence.
36.0 Demonstrate proficiency in producing a digital media product for delivery using satellite delivery systems.
37.0 Describe the evolution, role, and characteristics of a Content Distribution Network (CDN) for delivering digital media to Internet points.
38.0 Demonstrate an understanding of Internet Protocol Television (IPTV) systems, their types, applications, and implementation issues.
39.0 Successfully plan out and produce a professional portfolio showcasing mastery of multimedia production and self-marketing.
40.0 Utilize best practices involving advanced professional grade equipment.
41.0 Use innovative means and perceptual understanding to communicate through varied content, media and digital art techniques.
42.0 Develop competence and dexterity, through the use of processes, tools and techniques for various media.
43.0 Examine career opportunities in the Digital Media Field to determine requisite skills, qualifications, supply-and-demand, market location and potential earnings.
44.0 Demonstrate professional organizational skills to influence sequential process when producing multimedia.
45.0 Demonstrate professional interview skills.

Florida Department of Education
Student Performance Standards

Program Title: Digital Media Technology
Career Certificate Program Number: Y500100

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**	
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)	
Course Number: DIG0080 **Occupational Completion Point: B** **Digital Media Technician – 600 Hours**	
16.0	Describe characteristics of digital media relative to format, standards, encoding schemes, and origin. The student will be able to:
16.01	Determine the meaning of symbols, key terms, and other domain-specific words and phrases.
16.02	Identify and differentiate the appropriate use of digital media formats based on standard industry practices.
16.03	Identify and differentiate the appropriate use of encoding schemes based on project needs.
16.04	Identify the difference between digital media source files and digital media delivery systems.
17.0	Compare and contrast various forms of digital media delivery systems. The student will be able to:
17.01	Identify the differences between fixed digital media formats and digital media streaming.
17.02	Identify the various forms of digital media content distribution.
17.03	Describe the development of digital media technology as it pertains to digital signage.
17.04	Describe the impact of mobile and Wi-Fi technologies on the digital media development industry.
18.0	Demonstrate an understanding of handling equipment, recording video and audio, exporting files and editing projects. The student will be able to:
18.01	Identify digital image file types and their appropriate uses.
18.02	Compare and contrast the similarities and differences between Standard Definition and High Definition recordings.
18.03	Describe and apply the characteristics of digital video.
18.04	Identify and describe the various application platforms used in digital video development.

	18.05 Create a video production that meets the industry standards of production.
19.0	Demonstrate an understanding of the characteristics, development medium, and technical aspects of digital audio. The student will be able to:
	19.01 Identify and describe the fundamental aspects of sound theory.
	19.02 Compare and contrast the similarities and differences between various audio recordings.
	19.03 Describe the characteristics of digital audio.
	19.04 Identify and describe the various application platforms used in digital audio recording and editing.
	19.05 Enhance storytelling using sound effects.
	19.06 Capture and edit original audio to be utilized with in class video production projects.
20.0	Create animation in digital media that enhances production. The student will be able to:
	20.01 Describe the process of developing animations and identify the industry standard platforms used in their creation.
	20.02 Describe the similarities and differences as well as industry standard platforms used in the development of 2D and 3D graphics.
	20.03 Identify and describe the challenges in developing and deploying digital media content.
	20.04 Identify the components and characteristics of motion that make up an animation.
	20.05 Create animations within production.
	20.06 Produce storyboarding, production plans (GANTT CHARTS) and playable rough cuts.
21.0	Perform safety skills while performing or recording on set. The student will be able to:
	21.01 Perform proper care of equipment.
	21.02 Demonstrate appropriate use of equipment in an efficient manner.
	21.03 Demonstrate awareness of appropriate ergonomics.
	21.04 Demonstrate safe ways to create action on set.
	21.05 Apply ethical practices.
22.0	Apply appropriate lighting for location and/or set productions. The student will be able to:
	22.01 Determine appropriate lighting needs for production settings.
	22.02 Identify locations and studio lighting types, method of use and application.
	22.03 Use lighting equipment according to industry safety standards.
23.0	Operate a video camera. The student will be able to:
	23.01 Use current industry standard production video equipment.

	23.02 Operate camera in studio and location (field) production environments.
	23.03 Align camera for studio production.
	23.04 Demonstrate appropriate framing for both SDTV and HDTV.
	23.05 Operate (CCU) Camera Control Uni.
24.0	Record, mix and edit audio resources. The student will be able to:
	24.01 Identify and select microphones for production needs.
	24.02 Determine optimal microphone placement.
	24.03 Establish appropriate recording conditions.
	24.04 Set up audio recording equipment.
	24.05 Perform appropriate pre-production check of production equipment.
	24.06 Record location sound.
	24.07 Record studio live sound.
	24.08 Perform basic routine, preventative and repair maintenance on video equipment.
	24.09 Define the various recording formats and media.
	24.10 Define appropriate digital compression and signal (file) types.
	24.11 Perform sound edits and enhancements.
25.0	Shoot studio and/or location footage. The student will be able to:
	25.01 Plan a shot to obtain required action/footage.
	25.02 Demonstrate appropriate shot sequences, transitions and post production (edit) effects.
	25.03 Control camera movement to obtain required effects.
	25.04 Control lens, focal length, aperture and exposure to obtain required effects.
	25.05 Set up camera and recording equipment sequence.
26.0	Design and generate graphic elements. The student will be able to:
	26.01 Determine the graphic requirements for a production.
	26.02 Operate graphic production software.
	26.03 Produce broadcast graphic elements for titling, credits and graphic transitions.
	26.04 Determine the special effects need for a production.

	26.05 Set up and operate character generator equipment and software.
	26.06 Generate appropriate special effects and animated elements for a production.
	26.07 Demonstrate an understanding of graphic image types, file formats, and technical requirements for a production.
	26.08 Use image editing (bit mapped) software.
	26.09 Edit graphics into the program or segment.
	26.10 Demonstrate an ability to use type, color, composition and graphic elements for a specific production effect.
	26.11 Demonstrate an ability to use different aspect ratios as needed for SDTV and HDTV.
	26.12 Identify and describe the standard practices for retrieving digital media assets both on local and remote work stations/networks.
	26.13 Describe the standard practices for establishing digital asset security.
	26.14 Describe the purpose and function of metadata as it pertains to the management of digital assets.
27.0	Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital video. The student will be able to:
	27.01 Produce video files according to industry standard specifications using digital media development hardware and software applications.
	27.02 Identify and incorporate the appropriate use of digital video encoding based on industry standard practices.
	27.03 Identify the various tools and procedures utilized in the conversion of digital media file types.
	27.04 Demonstrate proficiency in the utilization of standard video production equipment.
	27.05 Demonstrate proficiency in the connectivity and configuration of digital video equipment.
	27.06 Identify and troubleshoot lighting issues as they pertain to the recording of digital video as well as describe common industry practices in the staging of light sources.
28.0	Demonstrate proficiency configuring and operating equipment and software applications used in the creation and delivery of digital audio. The student will be able to:
	28.01 Produce audio files according to industry standard specifications using digital media development hardware and software applications.
	28.02 Demonstrate proficiency in the utilization of standard audio production equipment.
	28.03 Demonstrate proficiency in the connectivity and configuration of digital audio equipment.
29.0	Apply industry standard workflow management methods applicable to the integration and synchronization of audio and video into a single digital media product. The student will be able to:
	29.01 Describe the various media integration systems and their appropriate uses in the development of digital media.
	29.02 Identify and describe the importance of version control in digital asset management.
	29.03 Identify and describe the various forms of digital audio/video synchronization and the tools and techniques used to sync digital audio and video.

	29.04 Successfully operate digital audio/video devices simultaneously in order to produce HD quality media to synchronize assets for post-production.
30.0	Apply industry standard asset management methods applicable to development of a digital media product. The student will be able to:
	30.01 Identify and describe the standard practices for storing and archiving digital media assets.
	30.02 Successfully apply and enhance upon industry standard practices for storing and archiving digital media assets.
	30.03 Identify and describe the standard practices for retrieving digital media assets both on local and remote work stations/networks.
	30.04 Describe the standard practices for establishing digital asset security.
	30.05 Describe the purpose and function of metadata as it pertains to the management of digital assets.
31.0	Explain the importance of calibration in the production of digital media and the means by which it is accomplished. The student will be able to:
	31.01 Identify the necessity and effects of calibration on various digital media systems.
	31.02 Identify standard practices in calibrating digital media production equipment.
	31.03 Use lighting for effect to control mood and impact in production settings.
	31.04 Use studio lighting master control equipment.
32.0	Demonstrate proficiency in producing a digital media product for delivery for both televised and online streaming media. The student will be able to:
	32.01 Identify and describe the various physical and application formats for (DVD) media technology.
	32.02 Identify and describe the various (DVD) physical outputs for media players.
	32.03 Identify the features and specifications of (DVD) media and the (DVD) format.
	32.04 Identify and describe the (DVD) media industry specification (red book standard).
	32.05 Identify and describe the various coding mechanisms utilized in the creation of (DVD) media.
	32.06 Identify and describe standard copy protection practices in (DVD) media creation.
	32.07 Use standard (DVD) authoring / editing systems in the creation of (DVD) media.
	32.08 Identify and describe the appropriate use of standard television formats (PAL & NTSC).
	32.09 Demonstrate an awareness of the issues in quality when compressing digital media.
33.0	Demonstrate proficiency in producing a digital media product for delivery using an Internet-based on-demand system (e.g., VOD, IPTV). The student will be able to:
	33.01 Develop digital media in the appropriate specified format for delivery on On-Demand Systems.
	33.02 Develop digital media in the appropriate specified format for delivery on Video on demand (VOD) Systems.
	33.03 Develop digital media in the appropriate specified format for delivery on IP Television (IPTV).

34.0	Demonstrate proficiency in producing a digital media product for delivery using an Internet-based streaming system. The student will be able to:
34.01	Develop digital media in the appropriate specified format for delivery on On-Demand Systems.
34.02	Develop digital media in the appropriate specified format for delivery on Video on demand (VOD) Systems.
34.03	Develop digital media in the appropriate specified format for delivery on IP Television (IPTV).
34.04	Develop digital media in the appropriate specified format for delivery on Grid Casting systems.
35.0	Demonstrate proficiency in producing a digital media product for delivery using an Internet-based system featuring multi-point presence. The student will be able to:
35.01	Demonstrate an awareness of the tools and practices used in establishing multiple points of presence.
35.02	Demonstrate an awareness of design constraints and attributes as they pertain to producing digital media for delivery on internet-based systems.
35.03	Demonstrate an awareness of communication channels and considerations as they pertain to producing digital media for delivery on internet-based systems.
36.0	Demonstrate proficiency in producing a digital media product for delivery using satellite delivery systems. The student will be able to:
36.01	Identify industry applications utilized in producing a digital media product for delivery using satellite delivery systems.
36.02	Identify current technologies and capabilities used in the production of a digital media product for delivery using satellite delivery systems.
36.03	Describe the current limitations (e.g. latency) of delivering digital media via satalite delivery systems.
36.04	Identify and describe common issues in delivering digital media via simulcast systems.
36.05	Identify and describe the process of delivering digital media via mulitcast systems.
37.0	Describe the evolution, role, and characteristics of a Content Distribution Network (CDN) for delivering digital media to Internet points. The student will be able to:
37.01	Describe content networking techniques as they pertain to the delivering of digital media to internet points.
38.0	Demonstrate an understanding of Internet Protocol Television (IPTV) systems, their types, applications, and implementation issues. The student will be able to:
38.01	Demonstrate an understanding of converged services and their application to Internet Protocol Television (IPTV).
38.02	Compare and contrast live versus stored media systems.
38.03	Demonstrate an understanding of Internet Protocol Television (IPTV) applications and delivery systems.
38.04	Demonstrate an understanding of common issues that pertain to the development of digital media for distribution over Internet Protocol Television (IPTV) systems.
39.0	Successfully plan out and produce a professional portfolio showcasing mastery of multimedia production and self-marketing. The student will be able to:
39.01	Showcase a high level of creative independence in producing multimedia content that focuses on the individual student's strengths

		and build upon any skills that may require additional practice throughout the Portfolio development.
	39.02	Student will both document and demonstrate both successful and unsuccessful progress a throughout their portfolio development by use of a Production Schedule or GANTT CHART.
	39.03	Write, direct and produce an amateur short film. This work will be continuously progressive until a Portfolio deadline is designated.
	39.04	Write, direct and produce an amateur commercial advertisement. This work will be continuously progressive until Portfolio deadline is designated.
	39.05	Write, direct and produce an amateur Visual Postcard. This work will be continuously progressive until Portfolio deadline is designated
	39.06	Write, direct and produce an amateur Motion Graphics based tutorial. This work will be continuously progressive until Portfolio deadline is designated
40.0	Utilize best practices involving advanced professional grade equipment. The student will be able to:	
	40.01	Pack and transport equipment.
	40.02	Identify and dismantle/assemble equipment.
	40.03	Locate, scout and obtain appropriate on site permission.
	40.04	Use model release form documents.
	40.05	Scout locations for proper electrical outlets.
	40.06	Plan, coordinate and manage a production GANTT Chart
	40.07	Define specific dates for multiple video production projects.
	40.08	Determine post-production requirements.
	40.09	Coordinate post-production values.
	40.10	Identify and attempt to resolve production issues during post-production.
	40.11	Practice leadership skills.
	40.12	Manage crew and staff during pre-planning and production.
	40.13	Present project proposals including script, storyboards and shot lists.
	40.14	Delegate and assign tasks to members during all phases of production.
	40.15	Examine career opportunities in the Digital Media field to determine requisite skills, qualifications, supply-and-demand, market location, and potential earning.
	40.16	Apply advanced color correction techniques to film.
	40.17	Demonstrate and apply primary practice of marketing sales techniques.
41.0	Use innovative means and perceptual understanding to communicate through varied content, media and digital art techniques. The student will be able to:	

	41.01	Showcase a high level of creative independence in producing multimedia content that focuses on the individual student's strengths and build upon any skills that may require additional practice throughout Portfolio development.
	41.02	Students will both document and demonstrate both successful and unsuccessful progress throughout their portfolio development by use of a Production Schedule or GANNT CHART.
	41.03	Write, direct and produce an amateur short film. This work will be continuously progressive until a Portfolio deadline is designated.
	41.04	Write, direct and produce an amateur commercial advertisement. This work will be continuously progressive until Portfolio deadline is designated.
	41.05	Write, direct and produce an amateur Visual Postcard. This work will be continuously progressive until Portfolio deadline is designated.
	41.06	Write, direct and produce an amateur Motion Graphics based tutorial. This work will be continuously progressive until Portfolio deadline is designated.
	41.07	Demonstrate strong use of graphical design programs (Photoshop, Illustrator) to edit, enhance and properly choose formats for placement and use in Premiere, Final Cut, Motion or After Effects.
42.0	Develop competence and dexterity, through practice, in the use of processes, tools and techniques for various media. The student will be able to:	
	42.01	Utilize best practices involving advanced professional grade equipment.
	42.02	Pack and transport equipment.
	42.03	Identify and dismantle/assemble equipment.
	42.04	Use model release form documents.
	42.05	Locate, scout and obtain appropriate on site permission as needed.
	42.06	Define specific dates for multiple video production projects.
	42.07	Coordinate post-production values.
	42.08	Identify and attempt to resolve production issues during post-production.
	42.09	Present project proposals including script, storyboards and shot lists.
	42.10	Delegate and assign tasks to members during all phases of production.
	42.11	Manage crew and staff during pre-planning and production.
43.0	Examine career opportunities in the Digital Media field to determine requisite skills, qualifications, supply-and-demand, market location, and potential earning. The student will be able to:	
	43.01	Demonstrate and apply primary practice of marketing sales techniques.
	43.02	Identify, demonstrate and practice modern day online and televised marketing techniques.
	43.03	Research average salary range for various Digital Media careers.
	43.04	Research existing Digital Media careers and determine specified skills and qualifications.

44.0	Demonstrate professional organizational skills to influence sequential process when producing multimedia. The student will be able to:
44.01	Properly save and export multiple formats of video, audio and images from specified editing programs for use in cross platform devices and software.
44.02	Use PC/MAC operating system to create multiple directories specified to the types of media being imported or used for their projects.
44.03	Identify known software issues and determine solutions.
44.04	Understand updated software and its system requirements.
45.0	Demonstrate professional interview skills. The student will be able to:
45.01	Showcase the value of their own skills during mock interviews.
45.02	Be able to present works to others and openly discuss the purpose of its value.
45.03	Initiate and participate in group discussions related to others progress and offer intuitive solutions as well as accepting constructive criticism and conforming to new processes.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

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instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Modeling Simulation Production**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y500200	
CIP Number	0511080402	
Grade Level	30, 31	
Program Length	1500 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computations (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

The Modeling and Simulation program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster and the expansive employment opportunities in the field of Modeling and Simulation. This course provides technical skill proficiency and includes competency-based applied learning through the use of hands-on labs and the development of a multi-year portfolio. Students will build academic knowledge, enhance higher-order reasoning and problem-solving skills, develop leadership and collaboration abilities and refine general employability and occupation-specific skills.

The content includes but is not limited to practical experiences in modeling and simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, prototype development, production processes and implementation challenges. Science, Computer Programming and Math are embedded throughout the program to emphasize the relationship between these areas and the field of Modeling and Simulation. To further enrich this course sequence it is recommended students take a sequence of electives in either visual arts, computer arts, or digital arts including but not limited to Computer Programming, Web Design, Gaming and Animation, Robotics and/or Geospatial/Geographic Information Systems Technology.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of six occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0770	Modeling & Simulation Technician	COMPU SCI 6 ENG&TEC ED1@2 TEC ED 1 @2 ENG 7G ENG TECH 7G INFO TECH 7G COMP PROG 7G ROBOTICS 7G BUS ED 1 @2 TV PRO TEC @7 7G COMM ART @ 7 7G	150 hours
B	CTS0776	Modeling & Simulation Programmer I		300 hours
C	CTS0777	Modeling & Simulation Programmer II		300 hours
D	CTS0778	Modeling & Simulation Advanced Programmer		300 hours
E	CTS0774	Modeling & Simulation Developer		450 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge.
02.0 Demonstrate information fluency using emerging research techniques and technology.
03.0 Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to Modeling and Simulation.
04.0 Explain intelligent systems as they relate to modeling, simulation and data analysis.
05.0 Demonstrate knowledge of different operating systems
06.0 Explore software evolution and lifecycle as it relates to modeling and simulation.
07.0 Understand the production process of modeling, simulation and entertainment.
08.0 Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets.
09.0 Demonstrate production use of high-end Game Engines.
10.0 Categorize the different gaming genres.
11.0 Describe the game development life cycle.
12.0 Develop a game design document.
13.0 Identify gameplay elements and their characteristics.
14.0 Explore the methods used to create and sustain player immersion.
15.0 Describe the general principles of storytelling.
16.0 Develop an understanding of programming languages as they relate to modeling and simulation.
17.0 Incorporate audio assets into modeling and simulation engine.
18.0 Implement multimedia programming as it relates to modeling simulation using a gaming engine.
19.0 Create and maintain documentation.
20.0 Compile, build and publish finished games and simulation.
21.0 Analyze, identify and use game engine physics.
22.0 Develop effective user interfaces (UI).
23.0 Use real time technology to model and simulate environments.
24.0 Demonstrate an understanding of underlying principles of numerical analysis and how it relates to modeling and simulation.
25.0 Plan program design using object oriented programming (OOP) for modeling and simulation.
26.0 Use programming to develop modeling and simulation applications.
27.0 Test programs related to modeling and simulation.
28.0 Explain visual simulation.
29.0 Analyze model fidelity as related to modeling and simulation techniques.
30.0 Demonstrate knowledge of rigging.
31.0 Demonstrate knowledge of basic character setup.
32.0 Demonstrate knowledge of motion capture systems.
33.0 Understand systems engineering for simulators.

34.0 Analyze numerical characteristics of univariate data sets to describe patterns and departure from patterns, using statistics for various distributions.
35.0 Perform program maintenance to troubleshoot and optimize code.
36.0 Use innovative technologies to create prototypes of models.
37.0 Develop and program complex artificial intelligence systems (AI).
38.0 Identify functions of advance memory and information processing.
39.0 Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices.
40.0 Build a simple scenario for experimentation or training.
41.0 Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation.
42.0 Use probabilities (relative frequency and theoretical), to plan and conduct an experiment that will address control, randomization and measurement of experimental error.
43.0 Use innovative technologies to create prototypes of models.
44.0 Apply the principles of entrepreneurism to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production.
45.0 Demonstrate information fluency using emerging research techniques and technology.

Florida Department of Education
Student Performance Standards

Program Title: **Modeling Simulation Production**
Career Certificate Program Number: **Y500200**

Course Number: CTS0770 **Occupational Completion Point: A** **Modeling & Simulation Technician – 150 Hours**	
01.0	Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge. The student will be able to:
01.01	Define and explain essential modeling and simulation terms and concepts.
01.02	Identify disciplines which use modeling and simulation tools and discuss their real world applications.
01.03	Identify modeling and simulation related careers and the educational and professional requirements for various fields.
01.04	Compare and contrast the central modeling and simulation concepts and careers.
01.05	Explain the past, present, and future importance of modeling and simulation.
02.0	Demonstrate information fluency using emerging research techniques and technology. The student will be able to:
02.01	Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer.).
02.02	Analyze internet safety issues and practice procedures for complying with acceptable use standards.
02.03	Use technology tools to collaborate and generate a deliverable product.
02.04	Develop and display an electronic portfolio.
02.05	Demonstrate research skills using browsers, search engines, directories, and databases.
02.06	Create and evaluate a list of materials found online for relevance, appropriateness and bias.
02.07	Create and communicate a multimedia presentation, including text, sound, and graphics as related to modeling and simulation concepts.
02.08	Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, Bing).
02.09	Identify effective Boolean search strategies.
02.10	Correlate the use of social media in the field of modeling and simulation for a variety of purposes.
02.11	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, pdf).
03.0	Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to Modeling and Simulation. The student will be able to:
03.01	Explain how information technology and modeling and simulation impact the operation and management of business and society.

	03.02	Explain the emergence of e-commerce and e-government and the potential impact on business and society.
	03.03	Trace the evolution of the Internet from its inception to the present and into the future.
	03.04	Analyze physical models and organize them conceptually based on their development and historical relevance.
	03.05	Use graphic technology to create a visualization of a historic simulator or synthetic environment that has evolved over time.
	03.06	Describe the evolution of the digital computer as it relates to modeling and simulation.
	03.07	Explain the need for and use of input devices and displays to design and create models and simulations.
	03.08	Demonstrate an understanding of storage management (e.g., hard drive, floppy disk) as it relates to creating and storing digital models and simulations.
	03.09	Identify the advantages and limitations of computer-generated models and simulation.
04.0	Explain intelligent systems as they relate to modeling, simulation and data analysis. The student will be able to:	
	04.01	Define intelligent system.
	04.02	Explain and examine structured logic and semantics.
	04.03	Explain the use of intelligent systems.
	04.04	Examine programs using the elements of an intelligent system.
05.0	Demonstrate knowledge of different operating systems. The student will be able to:	
	05.01	Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).
	05.02	Discuss the impact of RAM and ROM technology on the development of the modern computer operating systems and microcomputers.
	05.03	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	05.04	Identify the internal components of a computer (e.g., power supply, hard drive, motherboard, input/output (I/O) cards/ports, cabling).
	05.05	Identify the different control systems for simulation.
	05.06	Explain the factors that can limit the simulation capabilities of personal computers.
06.0	Explore software evolution and lifecycle as it relates to modeling and simulation. The student will be able to:	
	06.01	Explain software and hardware lifecycles and their steps.
	06.02	Demonstrate an understanding of the basic concepts of computer maintenance, upgrades and life cycles.
07.0	Understand the production process of modeling, simulation and entertainment. The student will be able to:	
	07.01	Explain software and hardware lifecycles and their steps.
	07.02	Demonstrate an understanding of the basic concepts of computer maintenance, upgrades and life cycles.
	07.03	Demonstrate speed and efficiency concepts.

	07.04 Demonstrate use of a production pipeline.
	07.05 Identify the departments of an animation studio
	07.06 Describe the interrelationships among departments.
	07.07 Demonstrate basic communication concepts (verbal, memos, paperwork).
	07.08 Identify the stages of production.
	07.09 Correctly use studio terms and jargon.
	07.10 Create and organize production paperwork into design/production documentation.
	07.11 Identify target audiences, markets, and demographics.
	07.12 Demonstrate ability to write a professionally formatted script.
	07.13 Demonstrate ability to breakdown a script into production elements (cast, props).
	07.14 Demonstrate understanding of visual storytelling and how storyboards are used during production.
08.0	Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets. The student will be able to:
	08.01 Practice ethical behaviors regarding copyright, citation, and plagiarism.
	08.02 Understand the process of patent application filing, product trials, and communication techniques to describe their product.
	08.03 Explain the purposes of copyrights, trademarks, and patents and understand the limitations and expectations.
	08.04 Explore and examine components of intellectual property such as patents, copyrights, trademarks, and trade secrets.
	08.05 Understand “Fair Use and Fair Dealing” practices.
	08.06 Understand the transfer and licensing of creative works.
	08.07 Understand the use of “exclusive rights” to intellectual creations.
	08.08 Utilize digital watermarking.
09.0	Demonstrate production use of high-end Game Engines. The student will be able to:
	09.01 Demonstrate working knowledge of interface and workspace.
	09.02 Setup projects properly.
	09.03 Create and transform game objects and edit their properties.
	09.04 Create and use collision models and triggers.
	09.05 Setup and modify camera.
	09.06 Apply input data into game systems.

	09.07 Implement animation setup.
	09.08 Create and modify particle systems and their properties.
	09.09 Design and implement visual effects using compositing techniques.
	09.10 Develop, test and implement game scripts.
10.0	Categorize the different gaming genres. The student will be able to:
	10.01 Research, compare and categorize different game genres.
	10.02 Analyze examples of different gaming genres.
	10.03 Define and use the necessary vocabulary related to gaming and the different game genres.
11.0	Describe the game development life cycle. The student will be able to:
	11.01 Identify steps in the pre-production process including the proof of concept and market research.
	11.02 Describe the iterative prototyping process (e.g., Alpha, Beta).
	11.03 Determine platform, technology and scripting requirements.
	11.04 Implement techniques of scenario development, levels, and missions.
	11.05 Discuss game testing requirements and methods.
12.0	Develop a game design document. The student will be able to:
	12.01 Evaluate and discuss the choice of delivery system.
	12.02 Evaluate and discuss choices of genre, game design software, art, digital media, and animation software.
	12.03 Create a game strategy overview, character overview, and storyboard overview.
	12.04 Define the rules of play and multi-player options.
	12.05 Create the layout and interfaces overview and digital media overview.
	12.06 Determine the gameplay interaction requirements and create the progression levels overview.
	12.07 Define strategic positioning of game immersion dynamics and psychological effect.
	12.08 Identify hardware and software constraints.
13.0	Identify gameplay elements and their characteristics. The student will be able to:
	13.01 Analyze and deconstruct game environments and interactions.
	13.02 Compare and contrast popular games and simulations in terms of player interaction, plot complexity, and rewards.
	13.03 Categorize gameplay elements by player types and target audience.

14.0	Explore the methods used to create and sustain player immersion. The student will be able to:
	14.01 Research and define the term “immersion”.
	14.02 Explore and explain factors that create player immersion in a game or simulation.
	14.03 Examine games and simulations and explain the methods each one uses to increase player immersion.
15.0	Describe the general principles of storytelling. The student will be able to:
	15.01 Identify the essential elements of a story.
	15.02 Describe how creative writing is used as a game design tool.
	15.03 Compare and contrast methods of delivering a story in a game.
Course Number: CTS0776 Occupational Completion Point: B Modeling & Simulation Programmer I – 300 Hours	
16.0	Develop an understanding of programming languages as they relate to modeling and simulation. The student will be able to:
	16.01 Explain the history of programming languages.
	16.02 Explain how compilers work.
	16.03 Identify the three types of programming design approaches (e.g., top-down, structured and object-oriented).
17.0	Incorporate audio assets into modeling and simulation engine. The student will be able to:
	17.01 Describe the audio effects workflow.
	17.02 Explain audio codecs and formats used in game/simulation engines.
	17.03 Import audio into the game/simulation engine.
	17.04 Use appropriate naming conventions for audio assets.
18.0	Implement multimedia programming as it relates to modeling simulation using a gaming engine. The student will be able to:
	18.01 Demonstrate proficiency in creating multiple composite objects.
	18.02 Demonstrate proficiency in moving composite graphics objects.
	18.03 Demonstrate proficiency in rotating composite graphics objects manually.
	18.04 Distinguish between flock and flee artificial intelligence algorithms.
	18.05 Write programs that use blitting.

	18.06 Identify the basic constructs used in bounding box collision algorithms.
	18.07 Identify the basic constructs used in truer bounding box collisions.
	18.08 Demonstrate proficiency in creating a bouncing simulation.
	18.09 Simulate pattern-based movement.
	18.10 Simulate multiple sprites movement.
	18.11 Identify the basic constructs used in keyboard input.
	18.12 Identify the basic constructs used in mouse input.
	18.13 Identify the basic constructs used in double buffering.
19.0	Create and maintain documentation. The student will be able to:
	19.01 Write documentation to assist operators and end-users.
	19.02 Follow established documentation standards.
	19.03 Update existing documentation to reflect program changes.
20.0	Compile, build and publish finished games and simulation. The student will be able to:
	20.01 Apply proper settings depending on the intended publishing platforms.
	20.02 Refine project to increase performance.
	20.03 Successfully build a game and simulation.
	20.04 Publish product to intended platform.
21.0	Analyze, identify and use game engine physics. The student will be able to:
	21.01 Identify the different components used by the engine’s physics system.
	21.02 Apply “ray casting” to solve different physics and collision problems.
	21.03 Change physics settings depending on simulation needs.
22.0	Develop effective user interfaces (UI). The student will be able to:
	22.01 Utilize various design techniques for UI development.
	22.02 Create clear, concise, responsive UI.

	22.03 Provide efficient feedback while interacting with the UI.
Course Number: CTS0777 Occupational Completion Point: C Modeling & Simulation Programmer II – 300 Hours	
23.0	Use real time technology to model and simulate environments. The student will be able to:
	23.01 Identify simulator applications.
	23.02 Identify where team simulators would be appropriate.
	23.03 Identify where individual simulators would be appropriate.
	23.04 Understand where and why networked simulators are used.
24.0	Demonstrate an understanding of underlying principles of numerical analysis and how it relates to modeling and simulation. The student will be able to:
	24.01 Apply logical reasoning skills to solve real-world problems through the development of mathematical models.
	24.02 Design a step-by-step plan (algorithm) to solve a given problem.
	24.03 Write program specifications that define the constraints of a given problem.
	24.04 Use a programmable calculator.
	24.05 Write an algorithm to solve mathematical problems using formulas, equations, and functions.
25.0	Plan program design using object oriented programming (OOP) for modeling and simulation. The student will be able to:
	25.01 Formulate a plan to determine program specifications individually or in groups.
	25.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
	25.03 Design programs to solve problems using problem-solving strategies.
26.0	Use programming to develop modeling and simulation applications. The student will be able to:
	26.01 Utilize reference manuals.
	26.02 Write programs according to recognized programming standards.
	26.03 Write internal documentation statements as needed in the program source code.
	26.04 Code programs in high-level languages for game/simulation applications.
	26.05 Write code that accesses sequential, random, and direct files.
	26.06 Code programs using logical statements (e.g., If-Then-Else, Do...While).
	26.07 Enter and modify source code using a program language editor.

	26.08 Code routines within programs that validate input data.
	26.09 Use the rounding function in calculations within programs.
	26.10 Write programs as part of a development team.
	26.11 Write event-driven programs.
	26.12 Write programs using timed-event strategies and methodologies.
	26.13 Write programs that include score keeping.
	26.14 Write programs that display text.
	26.15 Write programs that use composite graphic objects.
	26.16 Write programs that load a bitmap for background.
	26.17 Write programs that utilize a sprite handler.
	26.18 Write programs that use animation.
	26.19 Write programs that use scrolling.
	26.20 Write programs that use transparency.
	26.21 Write documentation to assist operators and end-users.
	26.22 Follow established documentation standards.
	26.23 Update existing documentation to reflect program changes.
27.0	Test programs related to modeling and simulation. The student will be able to:
	27.01 Perform debugging activities.
	27.02 Evaluate program test results.
	27.03 Use trace routines of compilers to assist in program debugging.
	27.04 Compile and run programs.
	27.05 Create a stable code base.
	27.06 Develop data for use in program testing.
	27.07 Distinguish among the different types of program and design errors.

Course Number: CTS0778 Occupational Completion Point: D Modeling & Simulation Advanced Programmer – 300 Hours	
28.0	Explain visual simulation. The student will be able to:
	28.01 Define and explain uses of visual simulation.
	28.02 Explain the use of visual simulation in distributed simulation.
	28.03 Explain the functions of the image generators, display and databases to support visual subsystem of simulators.
29.0	Explain distributed simulation. The student will be able to:
	29.01 Explain networking concepts.
	29.02 Explain distributed simulation protocols.
	29.03 Explain the major components in a networked simulation or model.
30.0	Explain object models. The student will be able to:
	30.01 Describe objects using object oriented design (OOD).
	30.02 Distinguish between abstract and real objects.
	30.03 Explain why object oriented design is an effective programming paradigm.
	30.04 Implement classes and methods.
	30.05 Describe the benefits of object oriented concepts.
	30.06 Describe object oriented design (OOD) using pseudo-code or Unified Modeling Language (UML).
31.0	Demonstrate an understanding of mathematical modeling in relation to the production process. The student will be able to:
	31.01 Explain mathematical modeling as processes.
	31.02 Explain the role of modeler in mathematical modeling.
	31.03 Identify job titles associated with mathematical modeling.
	31.04 Explain the modeling production pipeline as it relates to mathematical modeling.
32.0	Demonstrate an understanding of 3D modeling and simulation software engines. The student will be able to:
	32.01 Understand concepts of the transfer of training.
	32.02 Understand mathematics of physics based real-time simulators.
	32.03 Describe components of visual systems (image generation, databases and displays).
	32.04 Describe theory of motion/control loading simulation and cue synchronization.

	32.05 Describe trainee station design, sensor simulation and instructor/operator station design.
	32.06 Understand and utilize collision detection.
33.0	Understand systems engineering for simulators. The student will be able to:
	33.01 Understand the systems engineering life cycle process and terminology.
	33.02 Identify the major milestones in the system life cycle.
	33.03 Understand the Systems Engineering life cycle process and terminology including the following: system requirements analysis, system design, hardware design and development, software design and development, system integration, configuration management, acceptance testing and contractor logistics support.
	33.04 Identify major milestones in the system life cycle such as preliminary/critical design reviews, establish function baseline, allocated baseline, product baseline and ready for training (RFT).
34.0	Analyze numerical characteristics of univariate data sets to describe patterns and departure from patterns, using statistics for various distributions. The student will be able to:
	34.01 Define terminology associated with data collection, statistics and graphing.
	34.02 Differentiate between the various methods of data collection.
	34.03 Explain the uses of random number generators.
	34.04 Recognize various sources of bias in data collection.
	34.05 Prepare a sample data collection.
	34.06 Determine the numerical characteristics of a data set and analyze data.
	34.07 Interpret tables of statistics.
	34.08 Create bar charts and pie graphs with appropriate software.
	34.09 Analyze the data to solve a presented problem.
	34.10 Apply problem analysis using flowcharts or the Unified Modeling Language (UML).
35.0	Perform program maintenance to troubleshoot and optimize code. The student will be able to:
	35.01 Review requested modification of programs and establish a plan of action.
	35.02 Design needed modifications in compliance with established standards.
	35.03 Code, test, and debug modifications prior to updating production code.
	35.04 Update production programs and documentation with changes.
	35.05 Analyze output to identify and annotate errors or enhancements.
36.0	Use innovative technologies to create prototypes of models. The student will be able to:

	36.01 Identify emerging technologies to develop prototypes.
	36.02 Compare and contrast the benefits and limitations of using various prototyping methods and costs.
	36.03 Use emerging technologies to create a prototype (i.e., 3D printing software, 3D printers or other applicable devices).
37.0	Develop and program complex artificial intelligence systems (AI). The student will be able to:
	37.01 Design intelligent interactions between players and AI.
	37.02 Implement different complex AI algorithms.
	37.03 Develop pathfinding systems for AI.
38.0	Identify functions of advance memory and information processing. The student will be able to:
	38.01 Manipulate data between numbering systems. (binary, decimal, hexadecimal).
	38.02 Identify how numeric and non-numeric data are represented in memory.
	38.03 Identify the characteristics and properties of reference variables and pointers.
	38.04 Apply efficient memory management techniques to prevent memory leaking.
Course Number: CTS0774 Occupational Completion Point: E Modeling & Simulation Developer – 450 Hours	
39.0	Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices. The student will be able to:
	39.01 Compare and contrast the appropriate use of various software and visualization applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
	39.02 Demonstrate proficiency in the use of various software and visualization applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
40.0	Build a simple scenario for experimentation or training. The student will be able to:
	40.01 Explain the importance of scenario building in simulations.
	40.02 Identify the building blocks of scenarios.
	40.03 Design a storyboard for a simulation.
	40.04 Build a simple simulation with a finite number of variables.
	40.05 Identify the various components of a simulation.
	40.06 Run a simulation application given specific parameters.
	40.07 Explain verification and validation of a simulation.

	40.08 Review the importance of scenario building in simulations.
	40.09 Explore/develop building blocks of scenarios.
	40.10 Design a detailed storyboard for a simulation.
	40.11 Build a simulation with a level of fidelity.
	40.12 Describe the history of gaming and evolution of video games.
	40.13 Design games using programming techniques.
	40.14 Implement a simple game using appropriate software.
41.0	Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation. The student will be able to:
	41.01 Use proper attributes to develop a flowchart.
	41.02 Compare various types of studies (i.e. survey, observation, experiment).
	41.03 Identify and explain an experimental design process.
	41.04 Set realistic objectives for the experiment.
	41.05 Determine the appropriate response or output.
	41.06 Select process variables or design parameters (control factors), noise factors and the interactions among the process variables of interest.
	41.07 Perform experimental design execution.
	41.08 Check that the data are consistent with the experimental assumptions.
	41.09 Interpret and present results.
42.0	Use probabilities (relative frequency and theoretical), to plan and conduct an experiment that will address control, randomization and measurement of experimental error. The student will be able to:
	42.01 Define and explain probability rules and event terminology.
	42.02 Identify events as complementary, dependent, independent, mutually exclusive or not mutually exclusive.
	42.03 Analyze categorical data using two-way tables to describe patterns and departure from patterns and to find marginal frequency and relative frequencies.
	42.04 Distinguish between empirical and theoretical probability.
	42.05 Calculate probabilities.
	42.06 Explain the law of large numbers.
	42.07 Calculate probabilities using addition rules.
	42.08 Calculate probabilities using the multiplications rules.

	42.09 Define the Fundamental Counting Rule, Permutation, and Combination.
	42.10 Perform calculations using the Fundamental Counting Rule, Permutation and Combination.
	42.11 Distinguish when one would use a permutation and when one would use a combination.
	42.12 Define experimental terminology.
	42.13 Explain potential reasons for experimental error.
	42.14 Demonstrate an understanding of the principles of probability by performing a probability experiment within the classroom.
43.0	Use innovative technologies to create prototypes of models. The student will be able to:
	43.01 Identify emerging technologies to develop prototypes.
	43.02 Compare and contrast the benefits and drawbacks of using various prototyping methods and costs.
	43.03 Use emerging technologies to create a prototype (i.e., 3D printing software, 3D printers or other applicable devices).
44.0	Apply the principles of entrepreneurism to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production. The student will be able to:
	44.01 Identify the usefulness of technology applications.
	44.02 Determine the design architecture.
	44.03 Formulate and test a proof of concept.
	44.04 Understand the value of partnerships and sub-contracting of production and distribution of product.
	44.05 Develop an understanding of the production process.
	44.06 Understand return on investment (ROI) concepts.
	44.07 Examine market analysis of product.
	44.08 Develop a comprehensive business model and present a clear and professional proposal to investors.
45.0	Demonstrate information fluency using emerging research techniques and technology. The student will be able to:
	45.01 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer).
	45.02 Analyze internet safety issues and practice procedures for complying with acceptable use standards.
	45.03 Use technology tools to collaborate and generate a deliverable product.
	45.04 Develop and display an electronic portfolio.
	45.05 Demonstrate research skills using browsers, search engines, directories, and databases.
	45.06 Create and evaluate a list of materials found online for relevance, appropriateness and bias.
	45.07 Create and communicate a multimedia presentation, including text, sound, and graphics as related to modeling and simulation

	concepts.
45.08	Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, Bing).
45.09	Identify effective Boolean search strategies.
45.10	Correlate the use of social media in the field of modeling and simulation for a variety of purposes.
45.11	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, pdf).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computations (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Modeling Simulation Design**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y500300	
CIP Number	0511080403	
Grade Level	30, 31	
Program Length	1500 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 10

Purpose

The Modeling Simulation Design program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster and the expansive employment opportunities in the field of Modeling and Simulation. This course provides technical skill proficiency and includes competency-based applied learning through the use of hands-on labs and the development of a multi-year portfolio. Students will build academic knowledge, enhance higher-order reasoning and problem-solving skills, develop leadership and collaboration abilities and refine general employability and occupation-specific skills.

The content includes but is not limited to practical experiences in modeling and simulation conceptualization, design, storyboarding, development methodologies, essential programming techniques, prototype development, production processes and implementation challenges. Science, Computer Programming, Math, 2D and 3D Art are embedded throughout the program to emphasize the relationship between these areas and the field of Modeling and Simulation. To further enrich this course sequence it is recommended students take a sequence of electives in either visual arts, computer arts, or digital arts including but not limited to Computer Programming, Web Design, 2D and 3D Art, Gaming and Animation, Robotics and/or Geospatial/Geographic Information Systems Technology.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of five occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	CTS0770	Modeling & Simulation Technician	COMPU SCI 6 ENG&TEC ED1@2 TEC ED 1 @2 ENG 7G ENG TECH 7G INFO TECH 7G COMP PROG 7G ROBOTICS 7G BUS ED 1 @2 TV PRO TEC @7 7G COMM ART @7 7G	150 hours
B	CTS0771	Modeling & Simulation 2D Artist		300 hours
C	CTS0772	Modeling & Simulation 3D Artist		300 hours
D	CTS0773	Modeling & Simulation Technical Artist		300 hours
E	CTS0774	Modeling & Simulation Developer		450 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge.
02.0 Demonstrate information fluency using emerging research techniques and technology.
03.0 Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to Modeling and Simulation.
04.0 Explain intelligent systems as they relate to modeling, simulation and data analysis.
05.0 Demonstrate knowledge of different operating systems.
06.0 Explore software evolution and lifecycle as it relates to modeling and simulation.
07.0 Understand the production process of modeling, simulation and entertainment.
08.0 Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets.
09.0 Demonstrate production use of high-end Game Engines.
10.0 Categorize the different gaming genres.
11.0 Describe the game development life cycle.
12.0 Develop a game design document.
13.0 Identify gameplay elements and their characteristics.
14.0 Explore the methods used to create and sustain player immersion.
15.0 Describe the general principles of storytelling.
16.0 Demonstrate an understanding of visual modeling in relation to the production process.
17.0 Understand the role of texture artists in relation to the production process.
18.0 Demonstrate knowledge of basic lighting.
19.0 Demonstrate knowledge of basic animation.
20.0 Demonstrate knowledge of photo editing software.
21.0 Demonstrate knowledge of video editing software.
22.0 Utilize basic audio production techniques, sound construction, and editing techniques as related to modeling and simulation.
23.0 Create and design a vector or bitmap art reference to develop a texture map to build a 3D model for simulation.
24.0 Demonstrate the use of experimental and engineering design techniques to produce real world or industry simulations.
25.0 Identify gameplay elements and their characteristics.
26.0 Explore the methods used to create and sustain player immersion.
27.0 Describe the general principles of storytelling.
28.0 Develop effective user interfaces (UI).
29.0 Explore the foundations of Digital Painting and Art.
30.0 Explore 2D texture painting techniques using painting software.
31.0 Demonstrate knowledge of basic materials and textures.
32.0 Apply industry standards for 3D animation software and user interface to create 3D simple and complex models.
33.0 Demonstrate basic understanding of modeling principles.
34.0 Explain environmental models.

35.0 Use visual modeling techniques and software to create an environmental model.
36.0 Demonstrate knowledge of basic 3D rendering.
37.0 Demonstrate knowledge of polygon modeling.
38.0 Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling.
39.0 Demonstrate knowledge of animation principles as it relates to the underlying physics of modeling.
40.0 Analyze model fidelity as related to modeling and simulation techniques.
41.0 Demonstrate knowledge of rigging.
42.0 Demonstrate knowledge of basic character setup.
43.0 Demonstrate knowledge of motion capture systems.
44.0 Explore 3D sculpting and texturing techniques using high polygon sculpting software.
45.0 Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices.
46.0 Build a simple scenario for experimentation or training.
47.0 Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation.
48.0 Use probabilities (relative frequency and theoretical), to plan and conduct an experiment that will address control, randomization and measurement of experimental error.
49.0 Use innovative technologies to create prototypes of models.
50.0 Apply the principles of entrepreneurism to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production.
51.0 Demonstrate information fluency using emerging research techniques and technology.

Florida Department of Education
Student Performance Standards

Program Title: **Modeling Simulation Production**
Career Certificate Program Number: **Y500300**

Course Number: CTS0770 **Occupational Completion Point: A** **Modeling & Simulation Technician – 150 Hours**	
01.0	Demonstrate an understanding of essential modeling and simulation terms by using them as they relate to specific careers requiring modeling and simulation skills and knowledge. The student will be able to:
01.01	Define and explain essential modeling and simulation terms and concepts.
01.02	Identify disciplines which use modeling and simulation tools and discuss their real world applications.
01.03	Identify modeling and simulation related careers and the educational and professional requirements for various fields.
01.04	Compare and contrast the central modeling and simulation concepts and careers.
01.05	Explain the past, present, and future importance of modeling and simulation.
02.0	Demonstrate information fluency using emerging research techniques and technology. The student will be able to:
02.01	Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer).
02.02	Analyze internet safety issues and practice procedures for complying with acceptable use standards.
02.03	Use technology tools to collaborate and generate a deliverable product.
02.04	Develop and display an electronic portfolio.
02.05	Demonstrate research skills using browsers, search engines, directories, and databases.
02.06	Create and evaluate a list of materials found online for relevance, appropriateness and bias.
02.07	Create and communicate a multimedia presentation, including text, sound, and graphics as related to modeling and simulation concepts.
02.08	Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, Bing).
02.09	Identify effective Boolean search strategies.
02.10	Correlate the use of social media in the field of modeling and simulation for a variety of purposes.
02.11	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, pdf).
03.0	Demonstrate a knowledge of the information technology industry, the history of computers including their components and functionality, as they relate to Modeling and Simulation. The student will be able to:
03.01	Explain how information technology and modeling and simulation impact the operation and management of business and society.

	03.02	Explain the emergence of e-commerce and e-government and the potential impact on business and society.
	03.03	Trace the evolution of the Internet from its inception to the present and into the future.
	03.04	Analyze physical models and organize them conceptually based on their development and historical relevance.
	03.05	Use graphic technology to create a visualization of a historic simulator or synthetic environment that has evolved over time.
	03.06	Describe the evolution of the digital computer as it relates to modeling and simulation.
	03.07	Explain the need for and use of input devices and displays to design and create models and simulations.
	03.08	Demonstrate an understanding of storage management (e.g., hard drive, floppy disk) as it relates to creating and storing digital models and simulations.
	03.09	Identify the advantages and limitations of computer-generated models and simulation.
04.0	Explain intelligent systems as they relate to modeling, simulation and data analysis. The student will be able to:	
	04.01	Define intelligent system.
	04.02	Explain and examine structured logic and semantics.
	04.03	Explain the use of intelligent systems.
	04.04	Examine programs using the elements of an intelligent system.
05.0	Demonstrate knowledge of different operating systems. The student will be able to:	
	05.01	Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).
	05.02	Discuss the impact of RAM and ROM technology on the development of the modern computer operating systems and microcomputers.
	05.03	Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
	05.04	Identify the internal components of a computer (e.g., power supply, hard drive, motherboard, input/output (I/O) cards/ports, cabling).
	05.05	Identify the different control systems for simulation.
	05.06	Explain the factors that can limit the simulation capabilities of personal computers.
06.0	Explore software evolution and lifecycle as it relates to modeling and simulation. The student will be able to:	
	06.01	Explain software and hardware lifecycles and their steps.
	06.02	Demonstrate an understanding of the basic concepts of computer maintenance, upgrades and life cycles.
07.0	Understand the production process of modeling, simulation and entertainment. The student will be able to:	
	07.01	Explain software and hardware lifecycles and their steps.
	07.02	Demonstrate an understanding of the basic concepts of computer maintenance, upgrades and life cycles.
	07.03	Demonstrate speed and efficiency concepts.

	07.04 Demonstrate use of a production pipeline.
	07.05 Identify the departments of an animation studio
	07.06 Describe the interrelationships among departments.
	07.07 Demonstrate basic communication concepts (verbal, memos, paperwork).
	07.08 Identify the stages of production.
	07.09 Correctly use studio terms and jargon.
	07.10 Create and organize production paperwork into design/production documentation.
	07.11 Identify target audiences, markets, and demographics.
	07.12 Demonstrate ability to write a professionally formatted script.
	07.13 Demonstrate ability to breakdown a script into production elements (cast, props).
	07.14 Demonstrate understanding of visual storytelling and how storyboards are used during production.
08.0	Understand the implications of intellectual property rights, copyright laws and plagiarism on creative assets. The student will be able to:
	08.01 Practice ethical behaviors regarding copyright, citation, and plagiarism.
	08.02 Understand the process of patent application filing, product trials, and communication techniques to describe their product.
	08.03 Explain the purposes of copyrights, trademarks, and patents and understand the limitations and expectations.
	08.04 Explore and examine components of intellectual property such as patents, copyrights, trademarks, and trade secrets.
	08.05 Understand “Fair Use and Fair Dealing” practices.
	08.06 Understand the transfer and licensing of creative works.
	08.07 Understand the use of “exclusive rights” to intellectual creations.
	08.08 Utilize digital watermarking.
09.0	Demonstrate production use of high-end Game Engines. The student will be able to:
	09.01 Demonstrate working knowledge of interface and workspace.
	09.02 Setup projects properly.
	09.03 Create and transform game objects and edit their properties.
	09.04 Create and use collision models and triggers.
	09.05 Setup and modify camera.
	09.06 Apply input data into game systems.

	09.07 Implement animation setup.
	09.08 Create and modify particle systems and their properties.
	09.09 Design and implement visual effects using compositing techniques.
	09.10 Develop, test and implement game scripts.
10.0	Categorize the different gaming genres. The student will be able to:
	10.01 Research, compare and categorize different game genres.
	10.02 Analyze examples of different gaming genres.
	10.03 Define and use the necessary vocabulary related to gaming and the different game genres.
11.0	Describe the game development life cycle. The student will be able to:
	11.01 Identify steps in the pre-production process including the proof of concept and market research.
	11.02 Describe the iterative prototyping process (e.g., Alpha, Beta).
	11.03 Determine platform, technology and scripting requirements.
	11.04 Implement techniques of scenario development, levels, and missions.
	11.05 Discuss game testing requirements and methods.
12.0	Develop a game design document. The student will be able to:
	12.01 Evaluate and discuss the choice of delivery system.
	12.02 Evaluate and discuss choices of genre, game design software, art, digital media, and animation software.
	12.03 Create a game strategy overview, character overview, and storyboard overview.
	12.04 Define the rules of play and multi-player options.
	12.05 Create the layout and interfaces overview and digital media overview.
	12.06 Determine the gameplay interaction requirements and create the progression levels overview.
	12.07 Define strategic positioning of game immersion dynamics and psychological effect.
	12.08 Identify hardware and software constraints.
13.0	Identify gameplay elements and their characteristics. The student will be able to:
	13.01 Analyze and deconstruct game environments and interactions.
	13.02 Compare and contrast popular games and simulations in terms of player interaction, plot complexity, and rewards.
	13.03 Categorize gameplay elements by player types and target audience.

14.0	Explore the methods used to create and sustain player immersion. The student will be able to:
14.01	Research and define the term “immersion”.
14.02	Explore and explain factors that create player immersion in a game or simulation.
14.03	Examine games and simulations and explain the methods each one uses to increase player immersion.
15.0	Describe the general principles of storytelling. The student will be able to:
15.01	Identify the essential elements of a story.
15.02	Describe how creative writing is used as a game design tool.
15.03	Compare and contrast methods of delivering a story in a game.
Course Number: CTS0771 Occupational Completion Point: B Modeling & Simulation 2D Artist – 300 Hours	
16.0	Demonstrate an understanding of visual modeling in relation to the production process. The student will be able to:
16.01	Explain visual modeling as a process.
16.02	Explain the role of a modeler in visual modeling.
16.03	Identify job titles associated with visual modeling.
16.04	Explain the modeling production pipeline as it relates to visual modeling.
17.0	Understand the role of texture artists in relation to the production process. The student will be able to:
17.01	Define texturing as a process.
17.02	Define the role of texture artist.
17.03	Identify job titles associated with texture artist.
17.04	Identify texture creation in the production pipeline.
17.05	Demonstrate knowledge of the difference between textures and shades.
18.0	Demonstrate knowledge of basic lighting. The student will be able to:
18.01	Compare and contrast real lighting with 3D lighting.
18.02	Demonstrate an understanding of 3 point lighting (key, fill, back).
18.03	Demonstrate an understanding of low-key and high-key lighting.
18.04	Use include/exclude commands to target light on objects.

	18.05 Demonstrate use of negative intensity.
19.0	Demonstrate knowledge of basic animation. The student will be able to:
	19.01 Apply animation principles to object animation.
	19.02 Demonstrate an understanding of animation timelines.
	19.03 Demonstrate an understanding of key framing.
	19.04 Record and edit keyframes.
	19.05 Demonstrate an understanding in the use of controllers.
	19.06 Render basic reference animation.
20.0	Demonstrate knowledge of photo editing software. The student will be able to:
	20.01 Demonstrate understanding file formats and storage options.
	20.02 Identify parts of the software interface (menus/palettes).
	20.03 Demonstrate ability to use each of the basic tool sets.
	20.04 Demonstrate ability to import, export and save images.
	20.05 Demonstrate understanding of layers and channels.
	20.06 Demonstrate understanding of filters, effects and plug-ins.
	20.07 Demonstrate understanding of file presets.
	20.08 Demonstrate ability to select portions of an image for manipulation.
	20.09 Demonstrate ability to transform selections and images (crop, scale).
	20.10 Demonstrate ability to color correct images (brightness, hue, contrast).
	20.11 Demonstrate ability to use brushes for image creation and correction.
	20.12 Understand non-destructive and destructive operations.
	20.13 Demonstrate the ability to import, paint and export 3D objects.
21.0	Demonstrate knowledge of video editing software. The student will be able to:
	21.01 Demonstrate understanding file formats and storage options.
	21.02 Identify parts of the software interface (menus/palettes).
	21.03 Demonstrate ability to use each of the basic tool sets.
	21.04 Demonstrate ability to import, export and save video.

	21.05 Demonstrate understanding of layers and compositing.
	21.06 Demonstrate understanding of filters, effects and plug-ins.
	21.07 Demonstrate understanding of file presets.
	21.08 Demonstrate understanding of rendering process.
	21.09 Demonstrate ability to transform video (crop, scale).
	21.10 Demonstrate ability to color correct images (brightness, hue, contrast).
	21.11 Demonstrate ability to use brushes for image creation and correction.
	21.12 Understand non-destructive and destructive operations.
	21.13 Demonstrate the compositing integration of rendered 3D animation with video.
22.0	Utilize basic audio production techniques, sound construction, and editing techniques as related to modeling and simulation. The student will be able to:
	22.01 Describe the use of digital recording decks and other digital storage devices.
	22.02 Describe the function and operation of digital audio workstations.
	22.03 Edit, cut, erase, and insert sound utilizing various digital production techniques.
	22.04 Perform digital noise reduction and noise extraction via spectral display.
	22.05 Survey and discuss the use of naming conventions and temp sounds.
	22.06 Demonstrate an understanding of various audio construction software.
	22.07 Analyze and discuss methods of matching sound effects to art assets.
	22.08 Identify and categorize commonly used technology sound engine integration equipment.
	22.09 Identify and discuss resources such as sound effects libraries.
	22.10 Examine methods of sound implementation and associated software.
	22.11 Explain how and why digital video may be integrated into a model or simulation design.
	22.12 Explain the roles and responsibilities of the sound design team.
	22.13 Describe the use of 3D and surround sound.
	22.14 Apply knowledge of distance/spatial effects, including surround sound, in a game/simulation.
	22.15 Analyze the relationship of the audio environment to the visual environment.
23.0	Create and design a vector or bitmap art reference to develop a texture map to build a 3D model for simulation. The student will be able to:
	23.01 Know the difference between vectors and bitmaps.

	23.02 Demonstrate an understanding of various 2D art programs.
	23.03 Utilize the programs tools and brushes.
	23.04 Know the importance of layers.
	23.05 Identify file formats.
	23.06 Use digital media software to create a vector of bitmap reference object.
	23.07 Import a reference object into 3D modeling software.
	23.08 Convert a reference object to 3D.
24.0	Demonstrate the use of experimental and engineering design techniques to produce real world or industry simulations. The student will be able to:
	24.01 Understand the design requirements and limitations of a 2D modeling and simulation engine.
	24.02 Demonstrate the use of various mediums and mixed media (traditional or digital) in a 2D modeling and simulation.
	24.03 Demonstrate the ability to create character and object views for animation.
	24.04 Break down animation into a series of pictures to import animation to a modeling and simulation engine.
	24.05 Demonstrate the effective use of animation loops and cycles in a modeling and simulation engine.
	24.06 Demonstrate an understanding of the value of timing to convey character motion.
	24.07 Demonstrate the effective use of animation arcs for the articulation of body elements.
	24.08 Demonstrate the use of principles of animation such as anticipation, squash, stretch, weight, exaggeration and overlapping secondary motion.
	24.09 Demonstrate the use of phonemes to display speech in animation.
25.0	Identify gameplay elements and their characteristics. The student will be able to:
	25.01 Analyze and deconstruct game environments and interactions.
	25.02 Compare and contrast popular games and simulations in terms of player interaction, plot complexity, and rewards.
	25.03 Categorize gameplay elements by player types and target audience.
26.0	Explore the methods used to create and sustain player immersion. The student will be able to:
	26.01 Research and define the term “immersion”.
	26.02 Explore and explain factors that create player immersion in a game or simulation.
	26.03 Examine games and simulations and explain the methods each one uses to increase player immersion.
27.0	Describe the general principles of storytelling. The student will be able to:
	27.01 Identify the essential elements of a story.

	27.02 Describe how creative writing is used as a game design tool.
	27.03 Compare and contrast methods of delivering a story in a game.
28.0	Develop effective user interfaces (UI). The student will be able to:
	28.01 Utilize various design techniques for UI development.
	28.02 Create clear, concise, responsive UI.
	28.03 Provide efficient feedback while interacting with the UI.
29.0	Explore the foundations of Digital Painting and Art. The student will be able to:
	29.01 Demonstrate knowledge of lines, shapes and values.
	29.02 Explain the importance of Value in digital painting and composition.
	29.03 Explain what Color Theory is and why it is important to design and composition.
	29.04 Demonstrate skill in drawing construction, thumbnails and clean lines.
	29.05 Demonstrate skill of blend and brush tools.
	29.06 Sketch base objects in perspective.
	29.07 Explain what makes a compelling composition and why it is important.
	29.08 Explain the importance of art studies and history.
	29.09 Create a landscape digital painting for use in game engine.
30.0	Explore 2D texture painting techniques using painting software. The student will be able to:
	30.01 Explain the differences between hard and soft surfaces
	30.02 Demonstrate skill in painting organic materials, texture, cloth, wood and metal.
	30.03 Demonstrate proper technique in applying painted materials to scenes and objects.
Course Number: CTS0772 Occupational Completion Point: C Modeling & Simulation 3D Artist – 300 Hours	
31.0	Demonstrate knowledge of basic materials and textures. The student will be able to:
	31.01 Demonstrate an understanding of material and texture storage.
	31.02 Apply textures to an object.
	31.03 Demonstrate an understanding of procedural shaders.

	31.04 Demonstrate an understanding of channels.
	31.05 Adjust the transparency, luminance, and reflection of a material.
	31.06 Demonstrate an understanding of displacement maps.
	31.07 Demonstrate an understanding of bump maps.
	31.08 Demonstrate knowledge of material projections.
	31.09 Demonstrate an understanding of UV mapping.
	31.10 Demonstrate an understanding of 3D painting.
	31.11 Understand how light affects the look of materials.
	31.12 Understand how camera angles can affect the look of materials.
32.0	Apply industry standards for 3D animation software and user interface to create 3D simple and complex models. The student will be able to:
	32.01 Identify the computer requirements for 3D animation software.
	32.02 Compare and contrast available 3D animation software.
	32.03 Identify available file formats and protocols.
	32.04 Explain the cinematic stage paradigm in 3D software.
	32.05 Demonstrate an understanding of naming conventions.
	32.06 Develop software and file backup plan.
	32.07 Identify common icons within the software.
	32.08 Demonstrate use of keyboard shortcuts.
	32.09 Understand the use of a three-button mouse.
	32.10 Identify the main windows of a 3D program.
	32.11 Identify common window layouts.
	32.12 Identify tool icons within the software.
	32.13 Understand the significance of keyboard shortcut use and efficiency.
	32.14 Demonstrate an understanding of the Euclidean Geometry Model (x-y-z coordinate system).
	32.15 Demonstrate an understanding of attribute managers.
	32.16 Demonstrate an understanding of layers.
	32.17 Navigate the modeling window using pan, rotate, and zoom controls.

	32.18 Demonstrate knowledge of selection tools (lasso, loop).
	32.19 View objects in wireframe, gourard shading, lines, boxes and modes.
	32.20 Demonstrate use of selection sets.
	32.21 Undo and redo an action within the program.
	32.22 Locate the help menu system.
33.0	Demonstrate basic understanding of modeling principles. The student will be able to:
	33.01 Understand 3D construction theory.
	33.02 Demonstrate an understanding of primitives and parametric modeling.
	33.03 Demonstrate an understanding of non-uniform rational basis spline (NURBS), splines, and polygonal modeling.
	33.04 Demonstrate the ability to use reference images and files while modeling.
34.0	Explain environmental models. The student will be able to:
	34.01 Explain the use of environmental modeling.
	34.02 Discuss how to model environmental effects.
	34.03 Discuss the effects of environmental simulations on related simulations.
	34.04 Examine environmental models available on the internet.
35.0	Use visual modeling techniques and software to create an environmental model. The student will be able to:
	35.01 Demonstrate information fluency by conducting research need to create an environmental model.
	35.02 Use modeling techniques and software to create a basic environmental model.
	35.03 Communicate the relevance of the model and its impact on the real world.
36.0	Demonstrate knowledge of basic 3D rendering. The student will be able to:
	36.01 Demonstrate an understanding of processor, hardware and software rendering techniques.
	36.02 Determine the final render format (size, codec, quality).
	36.03 Demonstrate an understanding of basic render settings.
	36.04 Select the range of frames to be rendered.
37.0	Demonstrate knowledge of polygon modeling. The student will be able to:
	37.01 Demonstrate an understanding of N-gons.
	37.02 Demonstrate an understanding of subdivision.

	37.03 Demonstrate basic polygon editing and manipulation.
	37.04 Demonstrate knowledge of point management (location).
	37.05 Demonstrate the ability to create polygonal models from points.
	37.06 Demonstrate an understanding of cutting/division tools.
	37.07 Demonstrate an understanding of extrudes.
	37.08 Demonstrate an understanding of symmetry.
	37.09 Demonstrate an understanding of hyper NURBS.
	37.10 Demonstrate an understanding of basic deformers (bend, twist, melt).
38.0	Demonstrate knowledge of non-uniform rational b-splines (NURBS) modeling. The student will be able to:
	38.01 Demonstrate an understanding of points, vertices, edges, and polygons.
	38.02 Demonstrate an understanding of poly-count.
	38.03 Demonstrate an understanding of primitives.
	38.04 Define parametric primitives.
	38.05 Locate an object's properties, attributes, and coordinates.
	38.06 Demonstrate understanding of Non uniform rational b-splines (NURBS).
	38.07 Demonstrate understanding of splines and generators (extrude, lathe, sweep).
	38.08 Understand the use of hierarchy.
	38.09 Demonstrate an understanding of Boolean objects.
	38.10 Demonstrate an understanding of Null objects.
	38.11 Demonstrate an understanding of scene management (hiding-unhiding).
	38.12 Demonstrate an understanding of arrays.
39.0	Demonstrate knowledge of animation principles as it relates to the underlying physics of modeling. The student will be able to:
	39.01 Demonstrate an understanding of the principle of squash and stretch.
	39.02 Demonstrate an understanding of the principle of anticipation.
	39.03 Demonstrate an understanding of the principle of staging.
	39.04 Demonstrate an understanding of the principle of straight ahead action and pose to pose.
	39.05 Demonstrate an understanding of the principle of follow through and overlapping action.

	39.06 Demonstrate an understanding of the principle of slow in and slow out.
	39.07 Demonstrate an understanding of the principle of arcs.
	39.08 Demonstrate an understanding of the principle of secondary action.
	39.09 Demonstrate an understanding of the principle of timing.
	39.10 Demonstrate an understanding of the principle of exaggeration.
	39.11 Demonstrate an understanding of the principle of solid drawing.
	39.12 Demonstrate an understanding of the principle of appeal.
Course Number: CTS0773 **Occupational Completion Point: D** **Modeling & Simulation Technical Artist – 300 Hours**	
40.0	Analyze model fidelity as related to modeling and simulation techniques. The student will be able to:
	40.01 Define fidelity.
	40.02 Discuss the ramifications of model fidelity parameters and their variations.
	40.03 Select the proper level of fidelity to solve a given problem.
	40.04 Identify the rationale for selecting fidelity level.
	40.05 Adjust model fidelity parameters to meet output requirements.
41.0	Demonstrate knowledge of rigging. The student will be able to:
	41.01 Define rigging as a process.
	41.02 Define the role of rigger.
	41.03 Identify job titles associated with a rigger.
	41.04 Identify rigging creation in the production pipeline.
42.0	Demonstrate knowledge of basic character setup. The student will be able to:
	42.01 Compare and contrast rigging approaches and styles.
	42.02 Demonstrate an understanding of the rig as it relates to the model.
	42.03 Demonstrate an understanding of skeletal systems.
43.0	Demonstrate knowledge of motion capture systems. The student will be able to:
	43.01 Understand knowledge of the history of motion capture.

	43.02 Understand the awareness of emerging technologies in the industry.
	43.03 Understand motion capture for 3D production.
44.0	Explore 3D sculpting and texturing techniques using high polygon sculpting software. The student will be able to:
	44.01 Navigate 3D sculpting interface and workspace.
	44.02 Create and Transform base object for sculpting.
	44.03 Create subdivisions of objects for high poly sculpting.
	44.04 Demonstrate working knowledge of sculpt and paint tools including creating sculpt layers and paint layers.
	44.05 Create high detail models using sculpt and paint tools.
	44.06 Demonstrate proficiency in Retopology.
	44.07 Display sculpts through model viewport filters.
Course Number: CTS0774 Occupational Completion Point: E Modeling & Simulation Developer – 450 Hours	
45.0	Demonstrate proficiency using various software applications while understanding the hardware requirements needed for modeling and simulations including processors, input/output (I/O) devices. The student will be able to:
	45.01 Compare and contrast the appropriate use of various software and visualization applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
	45.02 Demonstrate proficiency in the use of various software and visualization applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).
46.0	Build a simple scenario for experimentation or training. The student will be able to:
	46.01 Explain the importance of scenario building in simulations.
	46.02 Identify the building blocks of scenarios.
	46.03 Design a storyboard for a simulation.
	46.04 Build a simple simulation with a finite number of variables.
	46.05 Identify the various components of a simulation.
	46.06 Run a simulation application given specific parameters.
	46.07 Explain verification and validation of a simulation.
	46.08 Review the importance of scenario building in simulations.
	46.09 Explore/develop building blocks of scenarios.

	46.10 Design a detailed storyboard for a simulation.
	46.11 Build a simulation with a level of fidelity.
	46.12 Describe the history of gaming and evolution of video games.
	46.13 Design games using programming techniques.
	46.14 Implement a simple game using appropriate software.
47.0	Demonstrate an understanding of underlying principles of experimental simulation and how it relates to modeling and simulation. The student will be able to:
	47.01 Use proper attributes to develop a flowchart.
	47.02 Compare various types of studies (i.e. survey, observation, experiment).
	47.03 Identify and explain an experimental design process.
	47.04 Set realistic objectives for the experiment.
	47.05 Determine the appropriate response or output.
	47.06 Select process variables or design parameters (control factors), noise factors and the interactions among the process variables of interest.
	47.07 Perform experimental design execution.
	47.08 Check that the data are consistent with the experimental assumptions.
	47.09 Interpret and present results.
48.0	Use probabilities (relative frequency and theoretical), to plan and conduct an experiment that will address control, randomization and measurement of experimental error. The student will be able to:
	48.01 Define and explain probability rules and event terminology.
	48.02 Identify events as complementary, dependent, independent, mutually exclusive or not mutually exclusive.
	48.03 Analyze categorical data using two-way tables to describe patterns and departure from patterns and to find marginal frequency and relative frequencies.
	48.04 Distinguish between empirical and theoretical probability.
	48.05 Calculate probabilities.
	48.06 Explain the law of large numbers.
	48.07 Calculate probabilities using addition rules.
	48.08 Calculate probabilities using the multiplications rules.
	48.09 Define the Fundamental Counting Rule, Permutation, and Combination.
	48.10 Perform calculations using the Fundamental Counting Rule, Permutation and Combination.

	48.11 Distinguish when one would use a permutation and when one would use a combination.
	48.12 Define experimental terminology.
	48.13 Explain potential reasons for experimental error.
	48.14 Demonstrate an understanding of the principles of probability by performing a probability experiment within the classroom.
49.0	Use innovative technologies to create prototypes of models. The student will be able to:
	49.01 Identify emerging technologies to develop prototypes.
	49.02 Compare and contrast the benefits and drawbacks of using various prototyping methods and costs.
	49.03 Use emerging technologies to create a prototype (i.e., 3D printing software, 3D printers or other applicable devices).
50.0	Apply the principles of entrepreneurism to Modeling and Simulation and demonstrate an understanding of the design and production of prototypes from conception to mass production. The student will be able to:
	50.01 Identify the usefulness of technology applications.
	50.02 Determine the design architecture.
	50.03 Formulate and test a proof of concept.
	50.04 Understand the value of partnerships and sub-contracting of production and distribution of product.
	50.05 Develop an understanding of the production process.
	50.06 Understand return on investment (ROI) concepts.
	50.07 Examine market analysis of product.
	50.08 Develop a comprehensive business model and present a clear and professional proposal to investors.
51.0	Demonstrate information fluency using emerging research techniques and technology. The student will be able to:
	51.01 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer).
	51.02 Analyze internet safety issues and practice procedures for complying with acceptable use standards.
	51.03 Use technology tools to collaborate and generate a deliverable product.
	51.04 Develop and display an electronic portfolio.
	51.05 Demonstrate research skills using browsers, search engines, directories, and databases.
	51.06 Create and evaluate a list of materials found online for relevance, appropriateness and bias.
	51.07 Create and communicate a multimedia presentation, including text, sound, and graphics as related to modeling and simulation concepts.
	51.08 Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, Bing).

51.09	Identify effective Boolean search strategies.
51.10	Correlate the use of social media in the field of modeling and simulation for a variety of purposes.
51.11	Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, pdf).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Web Development**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y700100	
CIP Number	0511080100	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	FBLA-PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as an Assistant Web Designer, a Web Designer, and Senior Web Designer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to operating system commands and web document development, design, promotion and scripting.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44(3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CTS0070	Web Design Foundations	BUS ED 1 @2 VOE @7 TC COOP ED @7 BUS DP @7 %G ELECT DP @7 %G CLERICAL @7 7G SECRETAR 7G TEC ELEC $7 G COMP SCI 6 COMM ART @7 7G WEB DEV 7 G	150 hours
	CTS0071	Web Interface Design		150 hours
C	CTS0049	Web Scripting		150 hours
	CTS0015	Web Media Integration		150 hours
D	CTS0017	Web Interactivity		150 hours
	CTS0016	Web E-Commerce		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Develop an awareness of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, the internet, and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Demonstrate proficiency setting website project requirements during the design phase and project planning phase of web development.
17.0 Demonstrate proficiency in creating a logical website file structure.
18.0 Create basic webpages that meet the industry standards as set forth by the W3C (World Wide Web Consortium).
19.0 Incorporate images and graphical formatting on a webpage.
20.0 Create a basic table structure.
21.0 Incorporate form structures in a webpage.
22.0 Discuss appropriate use of frame structures and their outdated usage.
23.0 Understand the basic principles of Cascading Style Sheets-CSS.
24.0 Use CSS to create basic webpages based on industry standards.
25.0 Understand webpage layout techniques including Absolute Positioning and modern responsive layout methods.
26.0 Understand basic web design technology.
27.0 Describe the process for publishing a website.
28.0 Describe how website performance is monitored and analyzed.
29.0 Create an informational website that conforms to industry standards as set forth by the W3C.
30.0 Demonstrate efficient, consistent website development practice (use of templates, snippets).

31.0 Demonstrate language arts knowledge and skills.
32.0 Demonstrate mathematics knowledge and skills.
33.0 Incorporate Human Computer Interface (HCI) principles of design.
34.0 Research and obtain information for use in designing the user interface.
35.0 Create a user-friendly interface using Cascading Style Sheets (CSS).
36.0 Create a CSS formatted informational website.
37.0 Demonstrate proficiency publishing, testing, monitoring, and maintaining a website.
38.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
39.0 Solve problems using critical thinking skills, creativity, and innovation.
40.0 Describe the roles within teams, work units, and larger environments as it relates to website project management.
41.0 Describe the importance of professional ethics and legal responsibilities as it relates to website development.
42.0 Discuss the differences between server-side and client-side scripting.
43.0 Demonstrate understanding of the Document Object Model (DOM).
44.0 Design, write, debug, and incorporate a JavaScript client-side script into a webpage.
45.0 Incorporate basic JavaScript form validation and form handling (using pre-built validation scripts of online libraries.
46.0 Use advanced JavaScript techniques.
47.0 Demonstrate understanding of JavaScript accessibility issues.
48.0 Select and modify appropriate library and pre-built JavaScript to incorporate into webpage.
49.0 Demonstrate understanding of XML vocabularies and documents.
50.0 Create and debug an XML Document.
51.0 Demonstrate an understanding of Asynchronous JavaScript and XML (AJAX) and its implications for web developers.
52.0 Plan and implement a multi-page website using AJAX techniques.
53.0 Incorporate Canvas API methods into a webpage.
54.0 Demonstrate an understanding of back-end scripting language.
55.0 Demonstrate an understanding of databases.
56.0 Demonstrate an understanding of Content Management Systems (CMS) and their implications for web development.
57.0 Use CMS features, functions, and extensions/modules to create/enhance a website.
58.0 Evaluate the suitability for and system requirements for a content management system.
59.0 Demonstrate an understanding of multimedia applications and their implications for web designers.
60.0 Create and incorporate interactive website components.
61.0 PDF document usage considerations.
62.0 Demonstrate proficiency using HTML5 features and functions.
63.0 Manage web development projects using version control tools.
64.0 Develop and present a professional web development portfolio.
65.0 Demonstrate knowledge and skills necessary to setup a secure E-commerce site.
66.0 Identify security issues associated with E-commerce and discuss methods to mitigate risks.
67.0 Apply skills necessary to set up an E-commerce storefront.
68.0 Employ techniques to enhance the value and profitability of an E-commerce website.
69.0 Develop evaluation and performance monitoring metrics and target goals for an E-commerce website.

Florida Department of Education
Student Performance Standards

Program Title: Web Development
Career Certificate Program Number: Y700100

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)
Course Number: CTS0070 **Occupational Completion Point: B** **Web Design Foundations (Assistant Web Designer) – 150 Hours**
16.0 Demonstrate proficiency setting website project requirements during the design phase and project planning phase of web development. The student will be able to:
16.01 Define information architecture.
16.02 Discuss the importance of information architecture to web design and development.
16.03 Conduct a client interview to determine the business purpose and needs.
16.04 Conduct a competitive analysis.
16.05 Describe the activities performed during the design phase and project planning phase of website development.
16.06 Demonstrate basic design principles (e.g., use of colors, proximity, rule of thirds, white space in the design of a website).
16.07 Define the site structure by creating a content map, site map, storyboard, associated wireframes, and web design comp for client approval.
16.08 Analyze and evaluate global site maps.
16.09 Discuss the legal and ethical issues (e.g., copyright laws, obtaining permission, public domain, proper citations) related to web design.
16.10 Describe accessibility and its implications on web design.
16.11 Identify the client and target audience needs, as well as the purpose of a website.
16.12 Describe project management responsibilities.
16.13 Define website project scope and scope creep.
16.14 Determine deadlines and deliverables for a website project.

	16.15 Discuss Americans with Disabilities Act (ADA) standards for accessibility.
17.0	Demonstrate proficiency in creating a logical website file structure. The student will be able to:
	17.01 Create an efficient, maintainable directory structure for a website, including the site root and subfolders for assets (e.g., images, templates, CSS).
	17.02 Demonstrate and use correct file paths for relative, site root relative, and absolute links.
	17.03 Apply acceptable and logical website file naming conventions (e.g., index.html, comments.htm, about_us.htm).
	17.04 Examine emerging and new markup languages.
	17.05 Determine browser or platform compatibility as it relates to webpage design.
	17.06 Identify common DOCTYPES (e.g., Strict, Transitional and Frameset, and HTML5) and describe their appropriate use.
18.0	Create basic webpages that meet the industry standards as set forth by the W3C (World Wide Web Consortium). The student will be able to:
	18.01 Create basic webpage structures using common markup elements and attributes.
	18.02 Incorporate list structures in a webpage (e.g., ordered, unordered, definition).
	18.03 Incorporate hyperlinks in a webpage (e.g., external, internal, email, named anchors).
	18.04 Describe the influence of the W3C in the web development industry.
	18.05 Write proper webpage syntax using tags and attributes that meet the standards set forth by the W3C.
	18.06 Incorporate common webpage elements and attributes in a webpage (e.g., title, comment tags, id).
	18.07 Differentiate between absolute and relative links used in a webpage.
	18.08 Define and incorporate the target attribute for hyperlinks suitable for its purpose.
	18.09 Use the HTML AUDIO and VIDEO tags to display a media file on the webpages.
19.0	Incorporate images and graphical formatting on a webpage. The student will be able to:
	19.01 Describe usage guidelines (e.g., format types, size, relevance) for integrating images and graphics onto a webpage.
	19.02 Compare and contrast standard image formats used in webpage design.
	19.03 Incorporate graphics into a webpage design.
	19.04 Create and incorporate image maps in a webpage.
	19.05 Optimize images and graphics for use in a webpage.
20.0	Create a basic table structure. The student will be able to:
	20.01 Describe how tables are used in web design.
	20.02 Discuss the advantages and disadvantages of incorporating tables in a webpage design.

	20.03 Define and modify table structures for the presentation of tabular information.
	20.04 Create accessible tables using standard table elements and attributes.
21.0	Incorporate form structures in a webpage. The student will be able to:
	21.01 Create an accessible form using common elements, including form, fieldset, legend, textarea, select, option, button, labels, and input (radio, checkbox, submit, reset, image, password, hidden).
	21.02 Describe and diagram the relationship between HTML forms and server-side technologies.
	21.03 Compare and contrast the GET and POST methods for forms handling.
	21.04 Define form validation and describe how it is accomplished.
	21.05 List popular server-side technologies often used to process content sent from HTML forms.
	21.06 Connect a HTML form to a server-side script for processing.
22.0	Discuss appropriate use of frame structures and their outdated usage. The student will be able to:
	22.01 Discuss using frames and iframe structures and the related security vulnerabilities, performance issues, and SEO issues.
	22.02 Describe appropriate uses of iframes.
23.0	Understand the basic principles of Cascading Style Sheets-CSS. The student will be able to:
	23.01 Define the purpose of CSS and describe its importance in web design.
	23.02 Discuss existing and emerging CSS versions.
	23.03 Explain how inheritance and specificity affect CSS rule conflicts.
	23.04 Discuss the different placement of CSS (e.g., inline, external, embedded).
24.0	Use CSS to create basic webpages based on industry standards. The student will be able to:
	24.01 Recognize and use element selectors, ID selectors, class selectors, pseudo-class selectors, and descendant selectors.
	24.02 Use inline, internal and external style sheets.
	24.03 Use the link and import methods to connect to an external style sheet.
	24.04 Apply basic CSS properties (background, border, color, float, font, height, line-height, list-style, margin, overflow, padding, text-align, text-indent, width).
	24.05 Use CSS to style tables (e.g., borders, width, spacing, alignment, background).
	24.06 Use CSS to enhance the appearance and usability of an HTML form.
25.0	Understand webpage layout techniques including Absolute Positioning and modern responsive layout methods. The student will be able to:
	25.01 Compare and contrast positioning types on a webpage.
	25.02 Describe the usage of AP elements in a webpage.

	25.03 Incorporate AP elements in a webpage layout using appropriate Div tags.
	25.04 Discuss the benefits and drawbacks of using AP elements for webpage layouts.
	25.05 Determine how the stacking order and z-index impact webpages created with AP elements.
	25.06 Compare and contrast Absolute Positioning with modern layout methods such as Flexbox and CSS Grid.
26.0	Understand basic web design technology. The student will be able to:
	26.01 Discuss client-side and server-side technologies.
	26.02 Define e-commerce types and usage.
	26.03 Describe database connectivity relative to websites.
27.0	Describe the process for publishing a website. The student will be able to:
	27.01 Explore domain name selection process.
	27.02 Identify process to register a domain name.
	27.03 Compare and contrast hosting providers, features, and selection criteria.
	27.04 Describe the various means for uploading website files (e.g., FTP, web-based tools).
28.0	Describe how website performance is monitored and analyzed. The student will be able to:
	28.01 Identify issues related to website maintenance.
	28.02 Use webpage validation tools.
	28.03 Describe website performance metrics (e.g., visits, time-on-page, time-on-site) and discuss their design implications.
	28.04 Demonstrate knowledge of accessibility problems and solutions.
	28.05 Discuss current basic Search Engine Optimization techniques.
	28.06 Explore common website analytic tools.
29.0	Create an informational website that conforms to industry standards as set forth by the W3C. The student will be able to:
	29.01 Use GUI (Graphical User Interface) web authoring software to create a multi-page informational website.
	29.02 Use image-editing software to enhance website designs with simple graphics.
	29.03 Enhance the website using client-side technologies (navigation bars, rollover images or text).
30.0	Demonstrate efficient, consistent website development practice (use of templates, snippets). The student will be able to:
	30.01 Produce website designs that would work equally well on various operating systems and platforms, browser versions/configurations, and devices.
	30.02 Describe various file formats that can be imported onto a website (tabular data, word processing, presentation, PDFs).

31.0	Demonstrate language arts knowledge and skills. The student will be able to:
31.01	Locate, comprehend and evaluate key elements of oral and written information.
31.02	Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
31.03	Present information formally and informally for specific purposes and audiences.
32.0	Demonstrate mathematics knowledge and skills. The student will be able to:
32.01	Demonstrate knowledge of arithmetic operations.
32.02	Analyze and apply data and measurements to solve problems and interpret documents.
32.03	Construct charts/tables/graphs using functions and data.
Course Number: CTS0071 Occupational Completion Point: B Web Interface Design (Assistant Web Designer) – 150 Hours	
33.0	Incorporate Human Computer Interface (HCI) principles of design. The student will be able to:
33.01	Describe the fundamental design principles of human computer interface.
33.02	Differentiate between computer and human factors in screen/page design.
33.03	Describe what is meant by an “intuitive” interface.
33.04	Describe how typography, color scheme, and graphic usage are used to set website feel/tone for various types of websites (e.g., educational, entertainment, ecommerce).
33.05	Identify and use the following design concepts: contrast, repetition, alignment, proximity, writing style.
33.06	Define and establish logo, identity, and branding needed for an effective website.
33.07	Evaluate the key HCI features included on a webpage storyboard (consistency, flexibility, feedback, error prevention, visibility, and accessibility).
33.08	Create a series of webpage storyboards that incorporate HCI design principles.
34.0	Research and obtain information for use in designing the user interface. The student will be able to:
34.01	Identify common user information needs, information gathering models, and methods for gathering user research.
34.02	Define the primary audience and customer expectations.
34.03	Describe target audience preferences based on demographics (e.g., gender, age, economic status, culture).
34.04	Identify and use web analytic tools to shape an information architecture strategy (describe and use key aspects and benefits of an information architecture strategy).
34.05	Apply the results of research and analytics to the design of a user interface.
35.0	Create a user-friendly interface using Cascading Style Sheets (CSS). The student will be able to:

	35.01 Create CSS styles suitable for use on a user-friendly webpage interface.
	35.02 Use element selectors, ID selectors, class selectors, pseudo-class selectors, and descendant selectors to create a table-less webpage design.
	35.03 Create a series of templates formatted exclusively using CSS.
	35.04 Use CSS syntax to configure and apply style sheets for multiple media displays (e.g., screen display and print).
	35.05 Use CSS syntax to implement custom web fonts on a webpage.
	35.06 Use CSS syntax to implement transitions and transformations to create animations on a webpage.
	35.07 Use CSS media queries to develop a responsive user interface.
	35.08 Explore various web authoring software (e.g. text editor or GUI editors).
	35.09 Create documented CSS style sheets for layout and appearance purposes.
36.0	Create a CSS formatted informational website. The student will be able to:
	36.01 Use GUI (Graphical User Interface) web authoring software to create a multi-page informational website.
	36.02 Create documented CSS style sheets for layout and appearance purposes.
	36.03 Incorporate methods used to drive traffic to the website, then engage and retain visitors.
	36.04 Apply standard search engine optimization (SEO) practices (e.g., keyword proximity; density; relevance; appropriate page titles, URLs, and headings, alt tags) to enhance search engine performance.
	36.05 Use standard design techniques to create websites and correct display issues using multiple browsers and platforms.
	36.06 Discuss the pros and cons of using existing and emerging animation software.
	36.07 Use client-side technologies such as rollovers and interactive components to enhance the user interface while considering accessibility and user experience best practices.
37.0	Demonstrate proficiency publishing, testing, monitoring, and maintaining a website. The student will be able to:
	37.01 Recognize the relationship between local and remote site structure.
	37.02 Identify methods of acquiring a domain name, appropriate hosting, and search engine registry.
	37.03 Understand and implement strategies to measure website traffic and improve search engine analytics reports.
	37.04 Describe the use of standard web marketing techniques.
	37.05 Describe how social media and social networking sites can be used for marketing purposes.
	37.06 Test websites using common resolutions, browsers, accessibility, and validation techniques.
	37.07 Use popular Internet browsers and tools as defined by W3C Browser Statistics (e.g., browser developer tools) to display and troubleshoot websites.
	37.08 Explore standard practices for feedback and usability testing.

	37.09 Identify and incorporate standard security measures in a website (Use up-to-date software, use strong passwords and multi-factor authentication, implement HTTPS, secure user accounts, back up data regularly).
	37.10 Identify and use online validation tools.
	37.11 Change invalid markup to comply with standards.
	37.12 Build a webpage that successfully passes the W3C validation test for HTML and CSS.
	37.13 Write markup that facilitates the W3C Web Accessibility Initiative (WAI) standards.
	37.14 Understand how to publish sites to remote server.
	37.15 Differentiate between local, testing, and remote website files and storage.
38.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
	38.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	38.02 Locate, organize and reference written information from various sources.
	38.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	38.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	38.05 Apply active listening skills to obtain and clarify information.
	38.06 Develop and interpret tables and charts to support written and oral communications.
	38.07 Exhibit public relations skills that aid in achieving customer satisfaction.
39.0	Solve problems using critical thinking skills, creativity, and innovation. The student will be able to:
	39.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	39.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	39.03 Identify and document workplace performance goals and monitor progress toward those goals.
	39.04 Conduct technical research to gather information necessary for decision-making.
40.0	Describe the roles within teams, work units, and larger environments as it relates to website project management. The student will be able to:
	40.01 Describe the types of websites and the major processes that make them successful (informational, e-commerce, educational, portfolios, news, entertainment, directories, social media, blogs, memberships, etc.)
	40.02 Explain project management and team member key roles.
	40.03 List and describe project management control systems (i.e., scope, timeframe, deliverables).
	40.04 Explain the impact of the global economy and cultures on website planning and production.
41.0	Describe the importance of professional ethics and legal responsibilities as it relates to website development. The student will be able to:

41.01	Evaluate and justify decisions based on ethical reasoning.
41.02	Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
41.03	Identify and explain personal and corporate consequences of unethical or illegal practices in website development.
41.04	Interpret and explain written organizational policies and procedures.
Course Number: CTS0049 Occupational Completion Point: C Web Scripting (Web Designer) – 150 Hours	
42.0	Discuss the differences between server-side and client-side scripting. The student will be able to:
42.01	Describe the role scripting languages play in the creation of websites.
42.02	Identify and describe the advantages, disadvantages, and primary uses of popular scripting languages (e.g., JavaScript, Perl, PHP, Jscript, Python).
43.0	Demonstrate understanding of the Document Object Model (DOM). The student will be able to:
43.01	Describe the purpose of the Document Object Model (layout, objects, properties, methods).
43.02	Describe how JavaScript uses the DOM to detect and manipulate elements on a webpage.
44.0	Design, write, debug, and incorporate a JavaScript client-side script into a webpage. The student will be able to:
44.01	Write, analyze, and explain basic JavaScript syntax.
44.02	Describe usage of various data types.
44.03	Describe how the use of decision-making logic (AND, OR) is employed in a JavaScript program.
44.04	Create and use variables, operators, and expressions.
44.05	Use common JavaScript events and event handlers (e.g., click, load, onClick, onLoad) to control program flow, appearance, or functionality.
44.06	Understand and incorporate JavaScript arrays (e.g., array basics, types, usage, methods, sorting).
44.07	Understand and incorporate JavaScript functions (e.g., using the DOM, pass a value, return value, create objects, work with classes, objects).
44.08	Understand and incorporate JavaScript loops and conditions (e.g., loop basics, types, usage).
44.09	Recognize, isolate, and correct common JavaScript errors (e.g., syntax, function errors, reserved word usage, unsupported DOM).
44.10	Apply JavaScript best coding practices (i.e., properly documenting scripts, field naming conventions, writing understandable code).
44.11	Use different methods to incorporate JavaScript onto a webpage (e.g., <script> element, JavaScript statement block, external scripts).
44.12	Troubleshoot and test incorporated script (i.e., functionality, browser usage, resolve known bugs).

45.0	Incorporate basic JavaScript form validation and form handling (using pre-built validation scripts or online libraries). The student will be able to:
	45.01 Identify and use form elements to solicit user input.
	45.02 Use JavaScript with HTML form controls.
	45.03 Validate web forms prior to submission.
	45.04 Use output commands to display processed data in an appropriately formatted form.
46.0	Use advanced JavaScript techniques. The student will be able to:
	46.01 Write JavaScript suitable for client-side interactivity, image manipulation, and the creation of custom JavaScript objects.
	46.02 Use JavaScript to incorporate, create, update, and delete cookies.
	46.03 Describe the common security issues relevant to JavaScript.
47.0	Demonstrate understanding of JavaScript accessibility issues. The student will be able to:
	47.01 Describe the purpose of the Browser Object Model (BOM) and how it relates to JavaScript.
	47.02 Design webpages to ensure accessibility and functionality in environments where JavaScript is limited or disabled.
48.0	Select and modify appropriate library and pre-built JavaScript to incorporate into webpage. The student will be able to:
	48.01 Explore common JavaScript libraries and describe the advantages and disadvantages of using libraries.
	48.02 Analyze pre-built scripting libraries and components to determine their functionality and effectiveness.
	48.03 Explain how scripting libraries or components achieve desired processing.
	48.04 Determine if pre-built script provides functionality required in an effective manner.
	48.05 Incorporate pre-built library items into webpages.
	48.06 Identify the restrictions related to using pre-built scripts (i.e., copyright, processing, and length of script).
	48.07 Modify pre-built scripts to suit functionality requirements.
	48.08 Test and troubleshoot pre-built scripts and widgets incorporated into webpages.

Course Number: CTS0015 **Occupational Completion Point: C** **Web Media Integration (Senior Web Designer) – 150 Hours**	
49.0	Demonstrate understanding of XML vocabularies and documents. The student will be able to:
	49.01 Understand XML vocabulary.

	49.02 Define well-formed and valid XML documents.
	49.03 Describe the basic structure of an XML document.
50.0	Create and debug an XML Document. The student will be able to:
	50.01 Create an XML declaration.
	50.02 Work with XML comments.
	50.03 Create XML elements and attributes.
	50.04 Work with character and entity references.
	50.05 Describe how XML handles character data, parsed character data, and white space.
	50.06 Work with XML parsers.
	50.07 Understand how web browsers work with XML documents.
	50.08 Apply a style sheet to an XML document.
	50.09 Work with XML to create a sitemap, which helps search engines crawl and index websites efficiently.
51.0	Demonstrate an understanding of Asynchronous JavaScript and XML (AJAX) and its implications for web developers. The student will be able to:
	51.01 Identify the technologies that comprise AJAX and explain how they interact.
	51.02 Describe the purpose, advantages, disadvantages, and functions of AJAX.
	51.03 Describe how AJAX works and how it is used in the creation of websites.
	51.04 Define appropriate use of AJAX in a web project.
	51.05 Identify AJAX Usability and Accessibility issues and their workarounds.
	51.06 Describe AJAX related browser compatibility issues and their workarounds.
	51.07 Explore popular AJAX applications currently on the Internet (auto-complete (Google), updating user content (Twitter), voting and rating (social bookmarking)).
	51.08 Describe common security issues associated to AJAX.
	51.09 Analyze the server-side implications of AJAX applications.
	51.10 Explore methods for testing and maintaining an AJAX application.
	51.11 Explore the future of AJAX and its implementation.
52.0	Plan and implement a multi-page website using AJAX techniques. The student will be able to:
	52.01 Research AJAX design principles and patterns (e.g., Observer, Command and MVC).
	52.02 Research and compare asynchronous JavaScript techniques and commonly used libraries.

	52.03 Identify and implement strategies for progressive enhancement of a webpage.
	52.04 Update specific areas of a page with data from the server (e.g., server-login updated) without reloading the webpage.
	52.05 Demonstrate the ability to transmit data in different formats (e.g., XML, JSON, alternatives to JavaScript).
	52.06 Use AJAX to create form submission and validation (e.g. password strength check, email/URL validation).
	52.07 Integrate a third-party image gallery component.
53.0	Incorporate Canvas API methods into a webpage. The student will be able to:
	53.01 Use the HTML CANVAS tag to create a drawing area on a webpage.
	53.02 Use JavaScript to write text on a canvas.
	53.03 Use JavaScript to draw basic shapes (e.g., lines, circles, squares) on a canvas.
	53.04 Use JavaScript to visualize data through interactive charts or graphs.
54.0	Demonstrate an understanding of back-end scripting language. The student will be able to:
	54.01 Define the purpose of back-end scripting language and describe its importance in web design.
	54.02 Discuss existing and emerging back-end scripting language versions.
	54.03 Discuss various configuration options for installing back-end scripting language on a server.
55.0	Demonstrate an understanding of databases. The student will be able to:
	55.01 Define the purpose of a database and describe its importance in web design.
	55.02 Discuss existing database management systems.

Course Number: CTS0017 **Occupational Completion Point: D** **Web Interactivity (Senior Web Designer) – 150 Hours**	
56.0	Demonstrate an understanding of Content Management Systems (CMS) and their implications for web development. The student will be able to:
	56.01 Describe the fundamental operation of a CMS.
	56.02 Describe the typical features of a content management system.
	56.03 Compare and contrast popular CMS applications (e.g., WordPress, Joomla).
	56.04 Describe how a content management system can be used to enhance website interactivity.
	56.05 Demonstrate proficiency in installing and configuring content management systems and extensions/modules.
57.0	Use CMS features, functions, and extensions/modules to create/enhance a website. The student will be able to:

	57.01 Create a basic multipage website using a content management system.
	57.02 Enhance a webpage by using a content management system to incorporate images, animations, or video segments.
	57.03 Incorporate a blog feature into a website using a content management system.
	57.04 Demonstrate proficiency using CMS built-in security for website, password and database backup.
	57.05 Demonstrate proficiency using add-on modules, or plug-ins.
58.0	Evaluate the suitability for and system requirements for a content management system. The student will be able to:
	58.01 Identify business goals and evaluate their suitability for a content management system.
	58.02 Determine web hosting system requirements.
	58.03 Create a schema for creating, deleting, and managing users and their permissions.
	58.04 Discuss the value represented by templates in a content management system development environment.
59.0	Demonstrate an understanding of multimedia applications and their implications for web designers. The student will be able to:
	59.01 Compare and contrast the leading multimedia development applications for website development (e.g., Adobe Flash, Microsoft Silverlight).
	59.02 Describe those circumstances whereby multimedia may be used to add interactivity to a website.
	59.03 Describe the limitations of multimedia development applications relative to website development viewed on various platforms (e.g., PCs, tablets, mobile devices).
60.0	Create and incorporate interactive website components. The student will be able to:
	60.01 Create buttons, menus, and other components that feature a static, hover, and rollover effect.
	60.02 Convert original artwork into an interactive component with associated script behavior.
	60.03 Adjust the component properties including opacity, filter, rotation, and action.
	60.04 Resize a multi-layer component to ensure uniform resizing of each layer.
	60.05 Create scrolling images, panels, and lists for incorporating into a web design.
	60.06 Create and incorporate animated banners, headers, and website introduction pages (e.g., Adobe Flash, Microsoft Silverlight).
61.0	PDF document usage considerations. The student will be able to:
	61.01 Discuss the advantages and disadvantages of using PDF documents in a website.
	61.02 Research and discuss PDF document usage best practices.
	61.03 Determine when it is appropriate to use PDF documents (e.g., brochure downloads, large reports, catalogs, interactive forms).
	61.04 Compare and contrast the functionality of software applications used to create and process PDFs.
	61.05 Research and describe search engine optimization considerations related to the use of PDF documents.

	61.06 Research and discuss security issues related to PDF document usage in a website (viruses, auto-open).
	61.07 Identify accessibility issues related to using PDF documents in a website.
62.0	Demonstrate proficiency using HTML5 features and functions. The student will be able to:
	62.01 Apply HTML5 APIs in webpages for interactivity (e.g., audio/video, drag & drop, drawing canvas).
	62.02 Apply HTML5 interactivity elements into webpages (i.e., <canvas>, <embed>, <audio>, <video>, <details>, <input>).
	62.03 Utilize HTML5 fallback strategies to address browser support issues.
	62.04 Utilize HTML5 to define dynamic behaviors using JavaScript.
	62.05 Use HTML5 specification to manipulate text and images.
	62.06 Use HTML5 to create persistent data and single session storage (HTML 5 Local Offline Storage & Session Storage).
	62.07 Use HTML5 for media event handling (audio, video, embed, image).
	62.08 Use HTML5 event handling for window, mouse, and form events.
	62.09 Use CSS3 to style HTML5 (e.g., transitions, typography enhancements).
63.0	Manage web development projects using version control tools. The student will be able to:
	63.01 Demonstrate understanding or version control concepts (e.g., commits, branches, repositories).
	63.02 Use version control tools to track, manage, and document changes in a web project.
	63.03 Collaborate on a shared web project using version control workflows.
64.0	Develop and present a professional web development portfolio. The student will be able to:
	64.01 Select and refine projects that demonstrate core competencies in web design and development.
	64.02 Organize and present portfolio content in a clear, accessible, and visually cohesive format.
	64.03 Incorporate industry-aligned best practices in layout, responsiveness, accessibility, and documentation.
	64.04 Present and refine the portfolio through peer review, mock interviews, or publication to a professional platform.
Course Number: CTS0016 Occupational Completion Point: D Web E-commerce (Senior Web Designer) – 150 Hours	
65.0	Demonstrate knowledge and skills necessary to setup a secure E-commerce site. The student will be able to:
	65.01 Compare and contrast popular pre-built shopping cart software.
	65.02 Compare and contrast hosting options available for use with shopping cart software (i.e., shared hosting or dedicated server).
	65.03 Discuss shopping cart vulnerabilities and best-practice preventative measures.

	65.04	Identify hardware and software necessary to install and setup pre-built shopping cart software.
	65.05	Install and configure necessary software (database, server) to run pre-built shopping cart software.
	65.06	Install and configure pre-built shopping cart software.
	65.07	Verify database and server connectivity.
	65.08	Test and troubleshoot setup/configuration issues.
66.0	Identify security issues associated with E-commerce and discuss methods to mitigate risks. The student will be able to:	
	66.01	Describe the differences between Transaction Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL).
	66.02	Explain transaction security.
	66.03	Compare common payment security practices and protocols used in e-commerce transactions, such as tokenization, encryption, secure transmission, and compliance standards.
	66.04	Demonstrate understanding of https and htaccess and their usage.
	66.05	Explore methods to obtain an SSL certificate and secure transactions.
	66.06	Compare and contrast the appropriateness of employing a merchant account or a payment gateway to handle online transactions.
	66.07	Discuss the process, advantages, disadvantages, and costs associated with opening a merchant account.
	66.08	Describe the process, advantages, disadvantages, and costs associated with using a payment gateway.
67.0	Apply skills necessary to set up an E-commerce storefront. The student will be able to:	
	67.01	Setup and use an FTP (File Transfer Protocol) program to transfer files to a web server.
	67.02	Add business specific information to site storefront (e.g., logos, product images, descriptions).
	67.03	Setup back-end site administration functions and navigation.
	67.04	Setup a schema for incorporating shipping, handling, and processing fees based on carrier, geographical zones, and weight/price range.
	67.05	Experiment with various add-ons, themes, and modules available for customization.
	67.06	Make simple modifications to a shopping cart to suit client needs (e.g., modify fields, add buttons).
	67.07	Customize forms to accommodate client products and/or services.
	67.08	Setup Search preferences and functionality for products and/or services.
	67.09	Setup customer contact preferences and email notification functionality.
	67.10	Apply Search Engine Optimization (SEO) techniques to shopping cart pages.
	67.11	Test operation of shopping cart pages in multiple browsers.
	67.12	Troubleshoot issues and errors related to browser display and functionality.

68.0	Employ techniques to enhance the value and profitability of an E-commerce website. The student will be able to:
68.01	Determine business goals for the E-commerce site.
68.02	Identify common types of digital advertising used in e-commerce, such as banner ads, search engine ads, sponsored content, and social media advertising.
68.03	Describe affiliate marketing and its implications for E-commerce websites.
68.04	Analyze popular affiliate programs/networks and available payment schemes.
68.05	Explain the differences, advantages, and disadvantages of CPM, PPC, and Pay per Sale/Lead.
68.06	Determine appropriate affiliate program for target audience.
68.07	Identify the method to join an affiliate program/network.
68.08	Identify considerations/requirements of selecting an affiliate program.
68.09	Determine appropriate number of affiliate programs necessary to suit client site.
68.10	Determine the terms and conditions of sale, including warranties, after-sales service, and privacy assurances.
68.11	Determine customer service options (e.g., e-mail, phone, fax).
68.12	Create a site map.
68.13	Create a Frequently Asked Questions (FAQ) page.
68.14	Create a product/version comparison chart, where appropriate.
68.15	Create feedback, review, survey, and recommendation pages.
69.0	Develop evaluation and performance monitoring metrics and target goals for an E-commerce website. The student will be able to:
69.01	Research existing and emerging analytical, usability, SEO tools to improve customer satisfaction and site conversion rates.
69.02	Describe web analytics tools and their features/functions.
69.03	Use web analytics tools to determine optimum site keywords.
69.04	Experiment with using advanced segments to view subsets of data (relating to purchasing habits, website usage, searches).
69.05	Customize analytic reports using appropriate metrics (e.g., average per-visit value, bounce rates, time spent on page).
69.06	Create more concise reports using advanced filters in web analytics tools.
69.07	Use intelligence features of web analytics tools to discover patterns of usage and set up corresponding alerts.
69.08	Research popular desktop and mobile analytics tools and their features.
69.09	Interpret analytic report data and optimize website accordingly, if appropriate.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan

with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Java Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y700200	
CIP Number	0511020313	
Grade Level	30, 31	
Program Length	1200 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA, SkillsUSA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating regular and specialized applications using the Java programming language, including testing, monitoring, debugging, documenting, and maintaining Java computer applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CTS0041	Computer Programmer Assistant	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	300 hours
C	CTS0044	Computer Programmer		150 hours
D	CTS0031	Java Developer		600 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
17.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development.
18.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
19.0 Distinguish between iterative and non-iterative program control structures.
20.0 Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted, and translated programming languages.
21.0 Describe the processes, methods, and conventions for software development and maintenance.
22.0 Explain the types, uses, and limitations of testing for ensuring quality control.
23.0 Create a program design document using Unified Modeling Language (UML) or other common design tool.
24.0 Solve problems using critical thinking skills, creativity and innovation.
25.0 Use information technology tools.
26.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
27.0 Design a computer program to meet specific physical, operational, and interaction criteria.
28.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
29.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.

30.0 Effectively communicate and collaborate.
31.0 Demonstrate responsible use of technology and information.
32.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
33.0 Create a project plan that defines requirements, structural design, time estimates, and testing elements.
34.0 Design, document, and create object-oriented computer programs.
35.0 Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results.
36.0 Understand human interactions in intelligence.
37.0 Construct statements that declare, initialize, and modify different types of variables used in Java programs.
38.0 Describe the types and characteristics of lexical units in the Java programming language.
39.0 Describe the data types employed in Java programs.
40.0 Construct Java statements that employ the use of various operators.
41.0 Write executable statements using Java.
42.0 Describe variable scope and its implications in Java programming.
43.0 Apply common Java programming style guidelines and conventions.
44.0 Demonstrate use of the compiler and interpreter through command line interface.
45.0 Construct conditional control statements in Java.
46.0 Construct iterative control statements in Java.
47.0 Use nested loop iterative control statements in Java.
48.0 Produce input and output for Java programs.
49.0 Use packages and import statements in a Java program.
50.0 Create a Java program that uses methods.
51.0 Create a Java program that uses parameters in methods.
52.0 Describe and use recursion in a Java program.
53.0 Construct Java statements that use the String class to manipulate String data.
54.0 Construct Java statements that use Classes.
55.0 Manage class relationships.
56.0 Construct Java statements that illustrate the use of multiplicities in class relationships.
57.0 Use object references.
58.0 Describe the types of arrays and construct Java statements that illustrate the use and manipulation of multi-dimensional and jagged arrays.
59.0 Construct Java statements that illustrate different ways of using inheritance.
60.0 Construct Java statements that use collections.
61.0 Write Java code that uses the Iterator and List interfaces.
62.0 Create Java code that includes exception handling code.
63.0 Create Java code that uses the Object class.
64.0 Use standard library classes that comprise the Java API.
65.0 Create Java code that uses exceptions to improve program quality.
66.0 Describe Java 2 Micro Edition (J2ME) uses, characteristics, and constraints.
67.0 Create and convert classes using Unified Modeling Language (UML).
68.0 Create programs that use of Remote Method Invocation (RMI) and other server technologies associated with Relational Database Management Systems (RDMS) and Structured Query Language (SQL).

69.0 Demonstrate an understanding of Java Integration APIs, including Java Message Service (JMS), Enterprise JavaBeans (EJB), and Java Naming and Directory Interface (JNDI).
70.0 Demonstrate an understanding of Java Client APIs, including the Abstract Window Toolkit (AWT), Swing, and Java applet.
71.0 Understand and apply Java 2 Enterprise Edition (J2EE) Server Solutions.
72.0 Create a database application using the Java programming language.
73.0 Create a graphical user interface application using the Java programming language.
74.0 Create a web-based application using the Java programming language.
75.0 Write code to perform common and union database queries using SQL and Java.
76.0 Implement Java program statements using objects.
77.0 Utilize debugging tools and write error handlers.
78.0 Demonstrate file I/O.
79.0 Utilize API functions.
80.0 Test and debug databases.
81.0 Successfully work as a member of a software development team.
82.0 Manage time according to a plan.
83.0 Keep acceptable records of progress, problems and solutions.
84.0 Plan, organize and carry out a project plan.
85.0 Manage resources.
86.0 Use tools, materials, and processes in an appropriate and safe manner.
87.0 Demonstrate an understanding of the software development process.
88.0 Research content related to the project and document the results.
89.0 Use presentation skills, and appropriate media to describe the progress, results and outcome of the experience.
90.0 Demonstrate competency in the area of expertise related to developing computer software using the Java programming language.

Florida Department of Education
Student Performance Standards

Program Title: Java Development and Programming
Career Certificate Program Number: Y700200

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)
Course Number: CTS0041 **Occupational Completion Point: B** **Computer Programmer Assistant – 300 Hours**
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
16.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
16.02 Locate, organize and reference written information from various sources.
16.03 Construct writings and/or communications using developmentally appropriate terminology.
16.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
16.05 Analyze the positive and negative impacts of technology on popular culture and personal life.
16.06 Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
16.07 Evaluate ways in which adaptive technologies may assist users with special needs.
16.08 Explain how societal and economic factors are affected by access to critical information.
16.09 Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
17.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to:
17.01 Explore a variety of careers to which computing is central.
17.02 Compare and contrast appropriate and inappropriate social networking behaviors.
17.03 Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, cloud computing).

	17.04 Evaluate the impacts of irresponsible use of information (e.g., plagiarism, falsification of data) on collaborative projects.
	17.05 Identify tasks performed by programmers.
	17.06 Describe how businesses use computer programming to solve business problems.
	17.07 Investigate job opportunities in the programming field.
	17.08 Explain different specializations and the related training in the computer programming field.
	17.09 Explain the need for continuing education and training of computer programmers.
	17.10 Understand and identify ways to use technology to support lifelong learning.
	17.11 Explain enterprise software systems and how they impact business.
	17.12 Describe ethical responsibilities of computer programmers.
	17.13 Describe the role of customer support to software program quality.
	17.14 Identify credentials and certifications that may improve employability for a computer programmer.
	17.15 Identify devices, tools, and other environments for which programmers may develop software.
18.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to:
	18.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	18.02 Explain the types and uses of variables in programs.
	18.03 Determine the best data type to use for given programming problems.
	18.04 Compare and contrast simple data structures and their uses.
	18.05 Identify the types of operations that can be performed on different data types.
	18.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	18.07 Explain how computers store different data types in memory.
	18.08 Demonstrate the difference between "data" and "information".
	18.09 Use different number systems to represent data.
	18.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	18.11 Use Boolean logic to perform logical operations.
19.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	19.01 Create non-iterative programming structures and explain their uses.
	19.02 Create iterative programming structures and explain their uses.

	19.03	Explain how sequence, selection, and iteration are building blocks of algorithms.
20.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:	
	20.01	Differentiate between multiple levels of an operating system, translation, and interpretation that support program execution.
	20.02	Explain the program execution process (by an interpreter and in CPU hardware).
	20.03	Describe object-oriented concepts.
	20.04	Explain the characteristics of procedural and object-oriented programming languages.
	20.05	Compare and contrast programming languages that are compiled, interpreted, and translated.
	20.06	Classify programming languages by paradigm and application domain (e.g., imperative, functional, logic languages and how well suited they are for certain application domains such as web programming, symbolic processing, data/numerical processing).
21.0	Describe the processes, methods, and conventions for software development and maintenance. The student will be able to:	
	21.01	Describe a software development process that is used to solve problems at different software development stages.
	21.02	Describe and demonstrate ethical and responsible use of modern communication media and devices.
	21.03	Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).
	21.04	List and explain the steps in the program development cycle.
	21.05	Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	21.06	Describe different methods used to facilitate version control.
22.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:	
	22.01	Explain the uses and limits of testing in ensuring program quality.
	22.02	Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	22.03	Describe and identify types of programming errors.
	22.04	Analyze and manipulate data collected by a variety of data collection techniques.
	22.05	Explain what tools are applied to provide automated testing environments.
23.0	Create a program design document using common design tool. The student will be able to:	
	23.01	Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	23.02	Describe tools for developing a program design (e.g., Unified Modeling Language, flowcharts, design documents, pseudocode).
	23.03	Explain the role of existing libraries and packages in facilitating programmer productivity.
	23.04	Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML,

		flowcharts, design documents, pseudocode).
	23.05	Write a program design document using standard design methodology.
	23.06	Define input and output for a program module using standard design methodology.
24.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:	
	24.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
	24.02	Employ critical thinking and interpersonal skills to resolve conflicts.
	24.03	Identify and document workplace performance goals and monitor progress toward those goals.
	24.04	Conduct technical research to gather information necessary for decision-making.
	24.05	Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
25.0	Use information technology tools. The student will be able to:	
	25.01	Use personal information management (PIM) applications to increase workplace efficiency.
	25.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	25.03	Employ computer applications to access, create, manage, integrate and store information.
	25.04	Employ collaborative/groupware applications to facilitate group work.
	25.05	Use a development process in creating a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data).
26.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:	
	26.01	Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	26.02	Discuss the impact of government regulation on privacy and security.
	26.03	Describe how different types of software licenses (e.g., open source, proprietary licenses) can be used to share and protect intellectual property.
	26.04	Explain how access to information may not include the right to distribute the information.
	26.05	Describe differences between open source, freeware and proprietary software licenses, and how they apply to different types of software.
	26.06	Discuss security and privacy issues that relate to computer networks.
	26.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts and harassment.
27.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:	

	27.01	Choose appropriate data types depending on the needs of the program.
	27.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
	27.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
	27.04	Compare techniques for analyzing massive data collections.
	27.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
	27.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
	27.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
	27.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
	27.09	Use an industrial-strength integrated development environment to implement a program.
28.0		Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
	28.01	Use appropriate naming conventions to define program variables and methods.
	28.02	Use a program editor to write the source code for a program.
	28.03	Write programs that use selection structures.
	28.04	Write programs that use repetition structures.
	28.05	Write programs that use nested structures.
	28.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.
	28.07	Compile, run, test and debug programs.
	28.08	Write programs that use standard arithmetic operators with different numerical data types.
	28.09	Write programs that use standard logic operators.
	28.10	Write programs that use a variety of common data types.
	28.11	Write programs that perform data conversion between standard data types.
	28.12	Write programs that define, use, search, and sort arrays.
	28.13	Write programs that use user-defined data types.
	28.14	Demonstrate understanding and use of appropriate variable scope.
	28.15	Explain recursive programming structure.

	28.16 Use global and local scope appropriately in program implementation.
29.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	29.01 Critically examine classical algorithms and implement an original algorithm.
	29.02 Write programs that perform user input and output.
	29.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	29.04 Write program modules such as functions, subroutines, or methods.
	29.05 Write program modules that accept arguments.
	29.06 Write program modules that return values.
	29.07 Write program modules that validate arguments and return error codes.
	29.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	29.09 Use APIs and libraries to facilitate programming solutions.
	29.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
30.0	Effectively communicate and collaborate. The student will be able to:
	30.01 Evaluate modes of communication and collaboration.
	30.02 Select appropriate tools within a project environment to communicate with project team members.
	30.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project.
	30.04 Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
	30.05 Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
	30.06 Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
31.0	Demonstrate responsible use of technology and information. The student will be able to:
	31.01 Explain the principles of cryptography by examining encryption, digital signatures, and authentication methods (e.g., explain why and how certificates are used with https for authentication and encryption).
	31.02 Implement an encryption, digital signature, or authentication method.
	31.03 Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people.

Course Number: CTS0044 Occupational Completion Point: C Computer Programmer – 150 Hours	
32.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
32.01	Demonstrate the understanding and use of classes, objects, attributes, and behaviors.
32.02	Demonstrate the understanding and use of inheritance.
32.03	Demonstrate the understanding and use of data encapsulation.
32.04	Demonstrate the understanding and use of polymorphism.
32.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
33.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates and testing elements. The student will be able to:
33.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program and testing it.
33.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements and other common components of a requirements document.
33.03	Design an object-oriented program using standard design methodology.
33.04	Work with other team members to develop a project plan for a program.
33.05	Work with other team members to write a design document for a program with multiple functions and shared data.
33.06	Participate in design meetings that review program design documents for conformance to program requirements.
33.07	Estimate the time to develop a program or module.
33.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
34.0	Design, document, and create object-oriented computer programs. The student will be able to:
34.01	Compare and contrast recursive functions to iterative methods.
34.02	Understand the implementation of character strings in the programming language.
34.03	Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
34.04	Write programs that implements user-defined data types.
34.05	Decompose a problem by defining new functions and classes.
34.06	Write object-oriented programs that implement inheritance.
34.07	Write object-oriented programs that implement polymorphism.
34.08	Develop class constructors.

	34.09	Write programs that define and use program constants.
	34.10	Write programs that perform error handling.
	34.11	Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity and conformance to program design documents.
	34.12	Describe the concept of parallel processing as a strategy to solve large problems.
	34.13	Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	34.14	Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	34.15	Write programs that use complex data structures (e.g., stacks, queues, trees, linked list).
	34.16	Write programs that are event-driven.
	34.17	Write programs that perform file input and output (i.e., sequential and random access file input/output).
	34.18	Explain intractable problems and understand that problems exists that are computationally unsolvable (undecidable) (e.g., classic intractable problems include Towers of Hanoi, TSP).
	34.19	Explain the value of heuristic algorithms to approximate solutions for intractable problems (e.g., a heuristic solution to TSP).
35.0	Design a unit test plan for an object-oriented computer program, test and debug the program and report the results. The student will be able to:	
	35.01	Develop a test plan for an object-oriented program.
	35.02	Write test plans for event-driven programs.
	35.03	Write test plans for programs that perform file input and output.
	35.04	Perform test and debug activities on object-oriented programs, including those written by someone else.
	35.05	Perform test and debug activities on an event-driven program.
	35.06	Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	35.07	Document the findings of testing in a test report.
36.0	Understand human interactions in intelligence. The student will be able to:	
	36.01	Describe the unique features of computers embedded in mobile devices and vehicles.
	36.02	Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.
	36.03	Describe the process of designing software to support specialized forms of human-computer interaction.
	36.04	Explain the notion of intelligent behavior through computer modeling and robotics.
	36.05	Describe common measurements of machine intelligence (e.g., Turing test).
	36.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception,

	machine learning).
36.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space and automotive fields.
Course Number: CTS0031 Occupational Completion Point: D Java Developer – 600 Hours	
37.0	Construct statements that declare, initialize, and modify different types of variables used in Java programs. The student will be able to:
37.01	Describe how variables are used in programs.
37.02	Identify the eight Java primitive data types.
37.03	Identify the minimum and maximum ranges of primitive data types.
37.04	Identify which data type should be used for a given situation.
37.05	Identify the syntax for using variables.
37.06	Declare and initialize variables.
37.07	Assign new values to variables.
37.08	Create and use constant variables.
38.0	Describe the types and characteristics of lexical units in the Java programming language. The student will be able to:
38.01	Describe the types of lexical units.
38.02	Describe identifiers and identify valid and invalid identifiers.
38.03	Describe and identify reserved words, delimiters, literals, and comments.
39.0	Describe the data types employed in Java programs. The student will be able to:
39.01	Describe the data type categories.
39.02	Give examples of primitives, reference data types.
39.03	Identify and use enumerations.
39.04	Understand the use of Wrapper Classes in programs.
39.05	Describe the difference between real and integer data types.
40.0	Construct Java statements that employ the use of various operators. The student will be able to:
40.01	Construct statements using arithmetic operators.
40.02	Construct statements using relational operators.

	40.03 Construct and use statements using logical operators.
	40.04 Construct and use statements using assignment operators.
	40.05 Construct and execute statements using operator precedence.
41.0	Write executable statements using Java. The student will be able to:
	41.01 Construct variable assignment statements.
	41.02 Construct statements using built-in math functions.
	41.03 Differentiate between implicit and explicit data type conversions.
	41.04 Describe when implicit data type conversions take place.
	41.05 List the drawbacks of implicit data type conversions.
	41.06 Describe the process of autoboxing and promotion.
	41.07 Construct statements using functions to explicitly convert data types.
42.0	Describe variable scope and its implications in Java programming. The student will be able to:
	42.01 Understand the scope and visibility of variables.
	42.02 Write programs using local variables.
	42.03 Describe the scope of a variable.
	42.04 Describe the default value of local, instance, and static scope of variables.
	42.05 Describe how compiler uses scope to identify variables with the same name.
43.0	Apply common Java programming style guidelines and conventions. The student will be able to:
	43.01 List examples of good programming practices.
	43.02 Insert comments into code.
	43.03 Follow formatting guidelines when writing code.
	43.04 Understand the different types of errors produced by programs.
44.0	Demonstrate use of the compiler and interpreter through command line interface. The student will be able to:
	44.01 Describe the use of the Java compiler (javac) and Java interpreter (Java VM).
	44.02 Demonstrate the use of the - classpath flag and –d flag to the compiler.
	44.03 Identify the environmental variables of PATH and CLASSPATH.
	44.04 Describe the process of command line arguments to the program.

	44.05 Create programs that take in multiple command line arguments.
45.0	Construct conditional control statements in Java. The student will be able to:
	45.01 Construct and use an if statement.
	45.02 Construct and use a switch statement.
	45.03 Construct and use a while, do while, and for loop.
	45.04 Construct and use a conditional operator.
46.0	Construct iterative control statements in Java. The student will be able to:
	46.01 Describe the types of loop statements and their uses.
	46.02 Construct and use the while and do while loop.
	46.03 Construct and use the for loop.
	46.04 Construct and use the enhanced for loop.
	46.05 Describe when a while loop is used.
	46.06 Describe when a for loop is used.
47.0	Use nested loop iterative control statements in Java. The student will be able to:
	47.01 Construct and execute a program using nested loops.
	47.02 Construct and execute a loop using break and continue.
	47.03 Evaluate a nested loop construct and sentinel value.
48.0	Produce input and output for Java programs. The student will be able to:
	48.01 Describe and use classes (e.g., Scanner, System) to input data into programs.
	48.02 Demonstrate the use of different ways to input data into programs using Scanner or System class.
	48.03 Describe and demonstrate the use of the System class to produce output to the console.
	48.04 Explain the difference between print and println functions in the System class.
	48.05 Create and use escape sequences.
49.0	Use packages and import statements in a Java program. The student will be able to:
	49.01 Describe the use of import statements.
	49.02 Describe the use of packages.
	49.03 Create code that uses package statements to avoid class conflict.

	49.04 Create packages that abide by standard Java naming convention.
	49.05 Demonstrate the use of Java-API to search for classes and packages.
50.0	Create a Java program that uses methods. The student will be able to:
	50.01 Differentiate between anonymous blocks and methods.
	50.02 Identify the benefits of using methods.
	50.03 Describe a method signature.
	50.04 Create a method.
	50.05 Describe how a method is invoked.
	50.06 Describe the purpose of overloading methods.
	50.07 Create overloaded methods in programs.
51.0	Create a Java program that uses parameters in methods. The student will be able to:
	51.01 Describe how parameters are passed into functions.
	51.02 Define a parameter.
	51.03 Create a method using a parameter.
	51.04 Invoke a method that has parameters.
	51.05 Distinguish between formal and actual parameters.
	51.06 Demonstrate the use of reference parameters in methods.
52.0	Describe and use recursion in a Java program. The student will be able to:
	52.01 Describe the use of recursion in solving problems.
	52.02 Describe the difference of iterative and recursive methods.
	52.03 Demonstrate the use of direct recursion.
	52.04 Demonstrate the use of indirect recursion.
53.0	Construct Java statements that use the String class to manipulate String data. The student will be able to:
	53.01 Explain the use of the String class.
	53.02 Create code to concatenate strings using the concatenation operator.
	53.03 Demonstrate how to search a string using indexOf method of the String class.
	53.04 Explain the effect of immutability of Strings.

	53.05 Create Strings using string literals, and through new keyword.
	53.06 Demonstrate the use of the following string manipulation methods of the String class: charAt,length, trim, substring, replace, startsWidth and endsWith.
54.0	Construct Java statements that use Classes. The student will be able to:
	54.01 Describe and identify abstract data types.
	54.02 Describe the difference between an object and a class.
	54.03 Identify class attributes.
	54.04 Create instance variables for a class.
	54.05 Use visibility modifiers for attributes.
	54.06 Identify constructors and describe their use.
	54.07 Describe encapsulation.
	54.08 Write class using encapsulation.
	54.09 Apply data abstraction through the use of accessor or/and mutator methods.
	54.10 Describe the equals method.
	54.11 Demonstrate the use of classes in methods as both parameters and return types.
	54.12 Describe the garbage collection process.
	54.13 Demonstrate reusability and extensibility in class creation.
	54.14 Demonstrate the use of Comparable interface to compare objects.
55.0	Manage class relationships. The student will be able to:
	55.01 Explain the association relationship among classes.
	55.02 Explain the direct association relationship among classes.
	55.03 Explain the composition and aggregation relationship among classes.
	55.04 Explain the direct association relationship among classes.
	55.05 Write programs that use composition, association.
	55.06 Write programs that use direct association.
56.0	Construct Java statements that illustrate the use of multiplicities in class relationships. The student will be able to:
	56.01 Describe how multiplicities affect class relationships.
	56.02 Describe one-to one, one-to-many, and many-to-many relationships.

	56.03 Write programs that use multiplicities in class relationships.
57.0	Use object references. The student will be able to:
	57.01 Identify reference aliases.
	57.02 Understand and use null reference.
	57.03 Explain the reference and its use in class creation.
58.0	Describe the types of arrays and construct Java statements that illustrate the use and manipulation of multi-dimensional and jagged arrays. The student will be able to:
	58.01 Declare and initialize and array.
	58.02 Demonstrate the use of initializer lists.
	58.03 Demonstrate the use of arrays in methods.
	58.04 Demonstrate the updating, populating and destroying arrays.
	58.05 Explain linear and binary searching.
	58.06 Sort arrays using selection sort, insertion sort, and bubble sort.
	58.07 Demonstrate the use of multidimensional arrays.
	58.08 Demonstrate the use of jagged arrays.
	58.09 Demonstrate basic hashing using arrays.
59.0	Construct Java statements that illustrate different ways of using inheritance. The student will be able to:
	59.01 Explain the purpose and use of inheritance in object oriented programming.
	59.02 Explain the difference between single and multiple inheritance.
	59.03 Create parent and child classes.
	59.04 Create overloaded methods.
	59.05 Describe the has-a and is-a relationship.
	59.06 Create class hierarchies.
	59.07 Explain the process of generalization to specification.
	59.08 Demonstrate the use of abstract classes.
	59.09 Explain polymorphism.
	59.10 Create a program that uses polymorphism.
	59.11 Demonstrate the use of the instanceof method.

60.0	Construct Java statements that use collections. The student will be able to:
	60.01 Describe data structure of linked lists.
	60.02 Create a linked list manually.
	60.03 Use the ArrayList class.
	60.04 Create a stack and Queue manually.
	60.05 Use the Stack and Queue standard class.
	60.06 Identify which data structure is best fitted for a situation.
	60.07 Use iterators with collections.
	60.08 Identify how to insert, delete, update and traverse data structures.
61.0	Write Java code that uses the Iterator and List interfaces. The student will be able to:
	61.01 Describe the purpose of interfaces.
	61.02 Create and use interfaces in programs.
	61.03 Use the Comparable interface.
	61.04 Use the Iterator interface and List Interface in programs.
	61.05 Understand the program to the interface principle.
62.0	Create Java code that includes exception handling code. The student will be able to:
	62.01 Describe the advantages of including exception handling code.
	62.02 Describe the purpose of an EXCEPTION section in a program block.
	62.03 Create code to include an EXCEPTION section.
	62.04 List the guidelines for exception handling.
63.0	Create Java code that uses the Object class. The student will be able to:
	63.01 Understand the Object class relationship to other classes.
	63.02 Demonstrate the use of toString method.
	63.03 Demonstrate the use of clone and finalize methods.
	63.04 Write program to use Object class functionality.
64.0	Use standard library classes that comprise the Java API. The student will be able to:
	64.01 Describe the classes and methods in the basic input/output package.

	64.02 Describe the classes and methods in the utilities package.
	64.03 Describe the classes and methods in the networking package.
	64.04 Describe the classes and methods in the AWT and swing package.
	64.05 Describe the classes and methods in the SQL and SQLX package.
65.0	Create Java code that uses exceptions to improve program quality. The student will be able to:
	65.01 Explain how exception handling works in Java.
	65.02 Trap exceptions using try and catch.
	65.03 Explain when to use the finally clause.
	65.04 Demonstrate handling exceptions through throwing and catching.
	65.05 Create and Exception and manage the exception.
	65.06 Explain the use of inheritance and exceptions.
66.0	Describe Java 2 Micro Edition (J2ME) uses, characteristics, and constraints. The student will be able to:
	66.01 Understand midlets.
	66.02 Explain CLDC and profiles.
	66.03 Explain the constraints specific to J2ME programming when compared to J2SE.
	66.04 Understand the high architectural goal of J2ME.
	66.05 Create user-defined functions.
67.0	Create and convert classes using Unified Modeling Language (UML). The student will be able to:
	67.01 Identify UML elements Classes, abstract Classes, Interfaces.
	67.02 Identify UML attributes, operators, visibility modifiers and UML associations.
	67.03 Given a set of classes be able to convert the classes to a UML diagram.
	67.04 Given a UML diagram be able to create classes.
68.0	Create programs that use of Remote Method Invocation (RMI) and other server technologies associated with Relational Database Management Systems (RDMS) and Structured Query Language (SQL). The student will be able to:
	68.01 Understand and describe RMI.
	68.02 Write a program to use RMI.
	68.03 Understand RDMS and SQL technologies.
	68.04 Use the Java Database Connectivity API to connect and execute SQL statements to RDMS.

69.0	Demonstrate an understanding of Java Integration APIs, including Java Message Service (JMS), Enterprise JavaBeans (EJB) and Java Naming and Directory Interface (JNDI). The student will be able to:
	69.01 Understand and describe JMS.
	69.02 Understand and describe EJB technology.
	69.03 Understand and describe JNDI technology.
70.0	Demonstrate an understanding of Java Client APIs, including the Abstract Window Toolkit (AWT), Swing and Java applet. The student will be able to:
	70.01 Understand and describe AWT and GUI interface.
	70.02 Understand and describe the use of Swing components and GUI.
	70.03 Understand and describe the use of applet technology.
71.0	Understand and apply Java 2 Enterprise Edition (J2EE) Server Solutions. The student will be able to:
	71.01 Understand java Web Services.
	71.02 Underrated and use SMTP and Java Mail technologies.
	71.03 Understand how to use JSP and Servlets.
72.0	Create a database application using the Java programming language. The student will be able to:
	72.01 Utilize loop statements.
	72.02 Given a scenario, use arithmetic, comparison, and pattern-matching operators.
	72.03 Create user-defined functions.
	72.04 Utilize common built-in functions.
	72.05 Declare variables in modules and procedures.
	72.06 Declare arrays and initialize elements of arrays.
	72.07 Declare and use object variables and collections and use their associated properties and methods.
	72.08 Declare symbolic constants and make them available locally or publicly.
	72.09 Respond to events.
73.0	Create a graphical user interface application using the Java programming language. The student will be able to:
	73.01 Utilize loop statements.
	73.02 Given a scenario, use arithmetic, comparison and pattern-matching operators.
	73.03 Create user-defined functions.
	73.04 Utilize common built-in functions.

	73.05 Declare variables in modules and procedures.
	73.06 Declare arrays and initialize elements of arrays.
	73.07 Declare and use object variables and collections and use their associated properties and methods.
	73.08 Declare symbolic constants and make them available locally or publicly.
	73.09 Use the Java Event model to handle user inputs from events.
	73.10 Use JComponents and layout managers to create the GUI.
74.0	Create a web-based application using the Java programming language. The student will be able to:
	74.01 Utilize loop statements.
	74.02 Given a scenario, use arithmetic, comparison and pattern-matching operators.
	74.03 Create user-defined functions.
	74.04 Utilize common built-in functions.
	74.05 Declare variables in modules and procedures.
	74.06 Declare arrays and initialize elements of arrays.
	74.07 Declare and use object variables and collections and use their associated properties and methods.
	74.08 Declare symbolic constants and make them available locally or publicly.
	74.09 Write JSP pages to process user input.
	74.10 Write Servlets to provide input and output processing for the web solution.
75.0	Write code to perform common and union database queries using SQL and Java. The student will be able to:
	75.01 Utilize SQL to write common queries.
	75.02 Refer to objects by using SQL.
	75.03 Utilize union queries.
76.0	Implement Java program statements using objects. The student will be able to:
	76.01 Determine when to use data access objects.
	76.02 Differentiate between objects and collections.
	76.03 Write statements that access and modify database objects, EJB objects.
	76.04 Select appropriate methods and property settings for use with specified objects.
77.0	Utilize debugging tools and write error handlers. The student will be able to:

	77.01 Trap errors.
	77.02 Utilize debugging tools to suspend program execution, and to examine, step through, and reset execution of code.
	77.03 Debug code samples.
	77.04 Utilize the Debugger to monitor variable values.
	77.05 Write an error handler.
78.0	Demonstrate file input/output (I/O). The student will be able to:
	78.01 Read from sequential and random access files.
	78.02 Write to sequential and random access files.
	78.03 Use file serialization.
79.0	Utilize API functions. The student will be able to:
	79.01 Properly declare functions.
	79.02 Use the by value and by reference parameters.
80.0	Test and debug databases. The student will be able to:
	80.01 Implement error handling.
	80.02 Test and debug library databases.
81.0	Successfully work as a member of a software development team. The student will be able to:
	81.01 Accept responsibility for specific tasks in a given situation.
	81.02 Document progress and provide feedback on work accomplished in a timely manner.
	81.03 Complete assigned tasks in a timely and professional manner.
	81.04 Reassign responsibilities when the need arises.
	81.05 Complete daily tasks as assigned on one’s own initiative.
82.0	Manage time according to a plan. The student will be able to:
	82.01 Set realistic time frames and schedules.
	82.02 Keep a written time sheet of work accomplished on a daily basis.
	82.03 Meet goals and objectives set by the team.
	82.04 Identify individual priorities.
	82.05 Complete a weekly evaluation of accomplishments, and reevaluate goals, objectives and priorities as needed.

83.0	Keep acceptable records of progress problems and solutions. The student will be able to:
	83.01 Develop a record keeping system in the form of a log book to record daily progress.
	83.02 Use a project journal to identify problem statement.
	83.03 Develop a portfolio of work accomplished to include design drawings, flowcharts, drawings and plans, and prototypes.
84.0	Plan, organize, and carry out a project plan. The student will be able to:
	84.01 Determine the scope of a project.
	84.02 Organize the team according to individual strengths.
	84.03 Assign specific tasks within a team.
	84.04 Determine project priorities.
	84.05 Identify required resources.
	84.06 Plan research, design, development and evaluation activities as required.
	84.07 Carry out the project plan to successful completion.
85.0	Manage resources. The student will be able to:
	85.01 Identify required resources for each stage of the project plan.
	85.02 Determine the methods needed to acquire needed resources.
	85.03 Demonstrate good judgment in the use of resources.
	85.04 Recycle and reuse resources where appropriate.
	85.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
86.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	86.01 Identify the proper tool for a given job.
	86.02 Use tools and machines in a safe manner.
	86.03 Adhere to laboratory or job site safety rules and procedures.
	86.04 Identify the application of processes appropriate to the task at hand.
	86.05 Identify materials appropriate to their application.
87.0	Demonstrate an understanding of the software development process. The student will be able to:
	87.01 State the goals of the software application clearly.
	87.02 Identify and write a plan to achieve each goal.

	87.03 Develop a list of materials and content required for each goal.
	87.04 Develop a step by step procedure for developing the application.
	87.05 Follow a written procedure.
	87.06 Record data from evaluation activities.
	87.07 Document conclusions and solutions based on evaluation results, observations and data.
	87.08 Document progress using a project log.
	87.09 Write an abstract describing the project plan.
88.0	Research content related to the project and document the results following industry conventions. The student will be able to:
	88.01 Identify the basic research needed to develop the project plan.
	88.02 Identify available resources for completing background research required in the project plan.
	88.03 Demonstrate the ability to locate resource materials in a library, data base, internet and other research resources.
	88.04 Demonstrate the ability to organize information retrieval.
	88.05 Demonstrate the ability to prepare a topic outline.
	88.06 Write a draft of the research report.
	88.07 Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations, and references.
	88.08 Prepare an electronically composed research paper in proper form.
	88.09 Conduct an alpha and beta evaluation of the project's product.
	88.10 Write a report on the evaluations, documenting results, data, observations and design changes based on the results.
89.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
	89.01 Prepare a multi-media presentation on the completed project.
	89.02 Make an oral presentation, using multi-media materials.
	89.03 Review the presentation and make changes in the delivery method(s) to improve presentation skills.
90.0	Demonstrate competency in the area of expertise related to developing computer software using the Java programming language. The student will be able to:
	90.01 Demonstrate a mastery of the content of the selected subject area.
	90.02 Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
	90.03 Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communication (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Database Application Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y700300	
CIP Number	0511020315	
Grade Level	30, 31	
Program Length	1200 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA, SkillsUSA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating regular and specialized applications using standard and extended Structured Query Language (SQL), including testing, monitoring, debugging, documenting, and maintaining database applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CTS0041	Computer Programmer Assistant	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	300 hours
C	CTS0044	Computer Programmer		150 hours
D	CTS0062	Database Programmer		600 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
17.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development.
18.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
19.0 Distinguish between iterative and non-iterative program control structures.
20.0 Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted, and translated programming languages.
21.0 Describe the processes, methods, and conventions for software development and maintenance.
22.0 Explain the types, uses, and limitations of testing for ensuring quality control.
23.0 Create a program design document using Unified Modeling Language (UML) or other common design tool.
24.0 Solve problems using critical thinking skills, creativity and innovation.
25.0 Use information technology tools.
26.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
27.0 Design a computer program to meet specific physical, operational, and interaction criteria.
28.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
29.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.

30.0 Effectively communicate and collaborate.
31.0 Demonstrate responsible use of technology and information.
32.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
33.0 Create a project plan that defines requirements, structural design, time estimates, and testing elements.
34.0 Design, document, and create object-oriented computer programs.
35.0 Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results.
36.0 Understand human interactions in intelligence.
37.0 Develop an awareness of the changes taking place in the information age and how they fit into an evolving society.
38.0 Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs.
39.0 Develop the process of creating an entity by identifying relationships.
40.0 Formulate and assemble initial entity relationship by expanding on modeling concepts.
41.0 Consider the degree and optionality of relationships of entities.
42.0 Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams.
43.0 Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships.
44.0 Demonstrate proficiency in designing and adding complexity to an entity-relationship model (ERM).
45.0 Apply complex ERM information by fine-tuning entities and the process for relating them.
46.0 Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved.
47.0 Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion or mistakes.
48.0 Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data.
49.0 Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database.
50.0 Extend the logical model presentation model by normalizing the data and mapping the management system.
51.0 Apply techniques for building a storage management system by creating a website using templates and wizards.
52.0 Demonstrate design and functionality by constructing a group business presentation.
53.0 Demonstrate comprehension of database modeling competency through group presentation.
54.0 Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints.
55.0 Demonstrate comprehension of aspects of SQL language interface by writing basic SQL statements.
56.0 Demonstrate proficiency working with columns, characters, and rows in SQL.
57.0 Demonstrate proficiency in using SQL comparison operators.
58.0 Demonstrate proficiency in using logical comparisons and precedence rules.
59.0 Demonstrate proficiency using SQL single row functions.
60.0 Demonstrate proficiency displaying data from multiple tables.
61.0 Demonstrate proficiency aggregating data using group functions.
62.0 Demonstrate proficiency utilizing subqueries.
63.0 Demonstrate proficiency producing readable output with SQL language interface, reporting tool, and data manipulation language.
64.0 Demonstrate proficiency creating and managing database objects.
65.0 Demonstrate proficiency altering tables and constraints implementing views.

66.0 Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects.
67.0 Demonstrate ability to control user access and SQL language interface and reporting tool.
68.0 Demonstrate comprehension of bundling features of SQL.
69.0 Demonstrate comprehension working with composite data types by writing executable script files.
70.0 Describe the differences between SQL and SQL extension languages.
71.0 Create program blocks.
72.0 Use variables in program blocks.
73.0 Recognize lexical units.
74.0 Recognize data types.
75.0 Use scalar data types.
76.0 Use various types of joins.
77.0 Use SQL group functions and subqueries.
78.0 Write executable statements.
79.0 Use nested blocks and variable scope.
80.0 Use good programming practices.
81.0 Write DML statements to manipulate data.
82.0 Retrieve data.
83.0 Manipulate data.
84.0 Use transaction control statements.
85.0 Use IF conditional control statements.
86.0 Use CASE conditional control statements.
87.0 Use basic LOOP iterative control statements.
88.0 Use WHILE and FOR loop iterative control statements.
89.0 Use nested loop iterative control statements.
90.0 Use explicit cursors.
91.0 Use explicit cursor attributes.
92.0 Use cursor FOR loops.
93.0 Use cursors with parameters.
94.0 Use cursors for update transactions.
95.0 Use multiple cursors.
96.0 Handle exceptions.
97.0 Trap server exceptions.
98.0 Trap user-defined exceptions.
99.0 Create procedures.
100.0 Use parameters in procedures.
101.0 Pass parameters.
102.0 Create stored functions.
103.0 Use functions in SQL statements.
104.0 Manage procedures and functions.
105.0 Manage object privileges.

106.0 Use invoker’s rights.
107.0 Create packages.
108.0 Manage package constructs.
109.0 Use advanced package concepts.
110.0 Manage persistent state of package variables.
111.0 Use vendor-supplied packages.
112.0 Understand dynamic SQL.
113.0 Understand triggers.
114.0 Create DML triggers.
115.0 Create DDL and database event triggers.
116.0 Manage triggers.
117.0 Use large object data types.
118.0 Manage binary types.
119.0 Manage indexes.
120.0 Manage dependencies.
121.0 Demonstrate an understanding of Agile Development.
122.0 Program a database application.
123.0 Utilize the basic concepts of database design.
124.0 Utilize SQL and union queries.
125.0 Implement program statements using objects.
126.0 Utilize debugging tools and write error handlers.
127.0 Demonstrate file I/O.
128.0 Create forms and identify all the properties of a form.
129.0 Manipulate data using object models.
130.0 Develop custom controls.
131.0 Utilize API functions.
132.0 Demonstrate and implement database replication using programming tools.
133.0 Analyze and implement security options.
134.0 Implement client/server applications.
135.0 Optimize the performance of a database.
136.0 Perform application distribution.
137.0 Test and debug databases.
138.0 Describe the difference between relational and NoSQL databases.
139.0 Demonstrate an understanding of Data Science and the concept of Data mining.

Florida Department of Education
Student Performance Standards

Program Title: Database Application Development & Programming
Career Certificate Program Number: Y700300

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)
Course Number: CTS0041 **Occupational Completion Point: B** **Computer Programmer Assistant – 300 Hours**
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
16.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
16.02 Locate, organize and reference written information from various sources.
16.03 Construct writings and/or communications using developmentally appropriate terminology.
16.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
16.05 Analyze the positive and negative impacts of technology on popular culture and personal life.
16.06 Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
16.07 Evaluate ways in which adaptive technologies may assist users with special needs.
16.08 Explain how societal and economic factors are affected by access to critical information.
16.09 Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
17.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. The student will be able to:
17.01 Explore a variety of careers to which computing is central.
17.02 Compare and contrast appropriate and inappropriate social networking behaviors.
17.03 Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, cloud computing).

	17.04 Evaluate the impacts of irresponsible use of information (e.g., plagiarism, falsification of data) on collaborative projects.
	17.05 Identify tasks performed by programmers.
	17.06 Describe how businesses use computer programming to solve business problems.
	17.07 Investigate job opportunities in the programming field.
	17.08 Explain different specializations and the related training in the computer programming field.
	17.09 Explain the need for continuing education and training of computer programmers.
	17.10 Understand and identify ways to use technology to support lifelong learning.
	17.11 Explain enterprise software systems and how they impact business.
	17.12 Describe ethical responsibilities of computer programmers.
	17.13 Describe the role of customer support to software program quality.
	17.14 Identify credentials and certifications that may improve employability for a computer programmer.
	17.15 Identify devices, tools, and other environments for which programmers may develop software.
18.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. The student will be able to:
	18.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	18.02 Explain the types and uses of variables in programs.
	18.03 Determine the best data type to use for given programming problems.
	18.04 Compare and contrast simple data structures and their uses.
	18.05 Identify the types of operations that can be performed on different data types.
	18.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	18.07 Explain how computers store different data types in memory.
	18.08 Demonstrate the difference between "data" and "information".
	18.09 Use different number systems to represent data.
	18.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	18.11 Use Boolean logic to perform logical operations.
19.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	19.01 Create non-iterative programming structures and explain their uses.
	19.02 Create iterative programming structures and explain their uses.

	19.03	Explain how sequence, selection, and iteration are building blocks of algorithms.
20.0	Differentiate among procedural, object-oriented, compiled, interpreted, and translated programming languages. The student will be able to:	
	20.01	Differentiate between multiple levels of an operating system, translation, and interpretation that support program execution.
	20.02	Explain the program execution process (by an interpreter and in CPU hardware).
	20.03	Describe object-oriented concepts.
	20.04	Explain the characteristics of procedural and object-oriented programming languages.
	20.05	Compare and contrast programming languages that are compiled, interpreted, and translated.
	20.06	Classify programming languages by paradigm and application domain (e.g., imperative, functional, logic languages and how well suited they are for certain application domains such as web programming, symbolic processing, data/numerical processing).
21.0	Describe the processes, methods, and conventions for software development and maintenance. The student will be able to:	
	21.01	Describe a software development process that is used to solve problems at different software development stages.
	21.02	Describe and demonstrate ethical and responsible use of modern communication media and devices.
	21.03	Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).
	21.04	List and explain the steps in the program development cycle.
	21.05	Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	21.06	Describe different methods used to facilitate version control.
22.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:	
	22.01	Explain the uses and limits of testing in ensuring program quality.
	22.02	Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	22.03	Describe and identify types of programming errors.
	22.04	Analyze and manipulate data collected by a variety of data collection techniques.
	22.05	Explain what tools are applied to provide automated testing environments.
23.0	Create a program design document using common design tool. The student will be able to:	
	23.01	Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	23.02	Describe tools for developing a program design (e.g., Unified Modeling Language, flowcharts, design documents, pseudocode).
	23.03	Explain the role of existing libraries and packages in facilitating programmer productivity.
	23.04	Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML,

		flowcharts, design documents, pseudocode).
	23.05	Write a program design document using standard design methodology.
	23.06	Define input and output for a program module using standard design methodology.
24.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:	
	24.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
	24.02	Employ critical thinking and interpersonal skills to resolve conflicts.
	24.03	Identify and document workplace performance goals and monitor progress toward those goals.
	24.04	Conduct technical research to gather information necessary for decision-making.
	24.05	Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
25.0	Use information technology tools. The student will be able to:	
	25.01	Use personal information management (PIM) applications to increase workplace efficiency.
	25.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	25.03	Employ computer applications to access, create, manage, integrate, and store information.
	25.04	Employ collaborative/groupware applications to facilitate group work.
	25.05	Use a development process in creating a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data).
26.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:	
	26.01	Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	26.02	Discuss the impact of government regulation on privacy and security.
	26.03	Describe how different types of software licenses (e.g., open source, proprietary licenses) can be used to share and protect intellectual property.
	26.04	Explain how access to information may not include the right to distribute the information.
	26.05	Describe differences between open source, freeware, and proprietary software licenses, and how they apply to different types of software.
	26.06	Discuss security and privacy issues that relate to computer networks.
	26.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
27.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:	

	27.01	Choose appropriate data types depending on the needs of the program.
	27.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
	27.03	Design and develop program for efficiency *(*e.g., less memory usage, less inputs/outputs, faster processing).
	27.04	Compare techniques for analyzing massive data collections.
	27.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
	27.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
	27.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
	27.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
	27.09	Use an industrial-strength integrated development environment to implement a program.
28.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:	
	28.01	Use appropriate naming conventions to define program variables and methods.
	28.02	Use a program editor to write the source code for a program.
	28.03	Write programs that use selection structures.
	28.04	Write programs that use repetition structures.
	28.05	Write programs that use nested structures.
	28.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.
	28.07	Compile, run, test and debug programs.
	28.08	Write programs that use standard arithmetic operators with different numerical data types.
	28.09	Write programs that use standard logic operators.
	28.10	Write programs that use a variety of common data types.
	28.11	Write programs that perform data conversion between standard data types.
	28.12	Write programs that define, use, search, and sort arrays.
	28.13	Write programs that use user-defined data types.
	28.14	Demonstrate understanding and use of appropriate variable scope.
	28.15	Explain recursive programming structure.

	28.16 Use global and local scope appropriately in program implementation.
29.0	Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input. The student will be able to:
	29.01 Critically examine classical algorithms and implement an original algorithm.
	29.02 Write programs that perform user input and output.
	29.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	29.04 Write program modules such as functions, subroutines, or methods.
	29.05 Write program modules that accept arguments.
	29.06 Write program modules that return values.
	29.07 Write program modules that validate arguments and return error codes.
	29.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	29.09 Use APIs and libraries to facilitate programming solutions.
	29.10 Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common programming standards.
30.0	Effectively communicate and collaborate. The student will be able to:
	30.01 Evaluate modes of communication and collaboration.
	30.02 Select appropriate tools within a project environment to communicate with project team members.
	30.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project.
	30.04 Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
	30.05 Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
	30.06 Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
31.0	Demonstrate responsible use of technology and information. The student will be able to:
	31.01 Explain the principles of cryptography by examining encryption, digital signatures, and authentication methods (e.g. explain why and how certificates are used with https for authentication and encryption).
	31.02 Implement an encryption, digital signature, or authentication method.
	31.03 Describe computer security vulnerabilities and methods of attack, and evaluate their social and economic impact on computer systems and people.

Course Number: CTS0044 Occupational Completion Point: C Computer Programmer – 150 Hours	
32.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
32.01	Demonstrate the understanding and use of classes, objects, attributes, and behaviors.
32.02	Demonstrate the understanding and use of inheritance.
32.03	Demonstrate the understanding and use of data encapsulation.
32.04	Demonstrate the understanding and use of polymorphism.
32.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
33.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates, and testing elements. The student will be able to:
33.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it.
33.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements, and other common components of a requirements document.
33.03	Design an object-oriented program using standard design methodology.
33.04	Work with other team members to develop a project plan for a program.
33.05	Work with other team members to write a design document for a program with multiple functions and shared data.
33.06	Participate in design meetings that review program design documents for conformance to program requirements.
33.07	Estimate the time to develop a program or module.
33.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
34.0	Design, document, and create object-oriented computer programs. The student will be able to:
34.01	Compare and contrast recursive functions to iterative methods.
34.02	Understand the implementation of character strings in the programming language.
34.03	Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
34.04	Write programs that implements user-defined data types.
34.05	Decompose a problem by defining new functions and classes.
34.06	Write object-oriented programs that implement inheritance.
34.07	Write object-oriented programs that implement polymorphism.
34.08	Develop class constructors.

	34.09	Write programs that define and use program constants.
	34.10	Write programs that perform error handling.
	34.11	Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity, and conformance to program design documents.
	34.12	Describe the concept of parallel processing as a strategy to solve large problems.
	34.13	Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	34.14	Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	34.15	Write programs that use complex data structures (e.g., stacks, queues, trees, linked list).
	34.16	Write programs that are event-driven.
	34.17	Write programs that perform file input and output (i.e., sequential and random access file input/output).
	34.18	Explain intractable problems and understand that problems exists that are computationally unsolvable (undecidable) (e.g., classic intractable problems include Towers of Hanoi, TSP).
	34.19	Explain the value of heuristic algorithms to approximate solutions for intractable problems (e.g., a heuristic solution to TSP).
35.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:	
	35.01	Develop a test plan for an object-oriented program.
	35.02	Write test plans for event-driven programs.
	35.03	Write test plans for programs that perform file input and output.
	35.04	Perform test and debug activities on object-oriented programs, including those written by someone else.
	35.05	Perform test and debug activities on an event-driven program.
	35.06	Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	35.07	Document the findings of testing in a test report.
36.0	Understand human interactions in intelligence. The student will be able to:	
	36.01	Describe the unique features of computers embedded in mobile devices and vehicles.
	36.02	Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.
	36.03	Describe the process of designing software to support specialized forms of human-computer interaction.
	36.04	Explain the notion of intelligent behavior through computer modeling and robotics.
	36.05	Describe common measurements of machine intelligence (e.g., Turing test).
	36.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception,

	machine learning).
36.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space, and automotive fields.
Course Number: CTS0062 Occupational Completion Point: D Database Programmer – 600 Hours	
37.0	Develop an awareness of the changes taking place in the information age and how they fit into an evolving society. The student will be able to:
37.01	Cite examples of jobs, salary, and opportunities he/she will have as a database programmer.
37.02	Describe the role a database plays in a business.
37.03	Understand the importance of clear communication when discussing business informational requirements.
37.04	Identify important historical contributions in database development and design.
38.0	Develop the "big picture" of database design and how to best organize data according to business rules and/or client needs. The student will be able to:
38.01	Identify and analyze the phases of the database development process.
38.02	Explain what logical data modeling and database design involve.
38.03	Compare database development process with that of the application development process.
38.04	Distinguish between a logical model and a physical implementation.
39.0	Develop the process of creating an entity by identifying relationships. The student will be able to:
39.01	Identify and model various types of entities.
39.02	Identify naming and drawing conventions for entities.
39.03	Sequence the steps that are necessary for creation of an entity.
39.04	Analyze and model the relationships between entities.
40.0	Formulate and assemble initial entity relationship by expanding on modeling concepts. The student will be able to:
40.01	Analyze and model attributes.
40.02	Identify unique identifiers for each entity.
40.03	Develop an entity relationship diagram tagging attributes with optionality.
41.0	Consider the degree and optionality of relationships of entities. The student will be able to:
41.01	Create entity relationship models based on information requirements and interviews.

	41.02 Differentiate between one-to-many, many-to-many and one-to-one relationships.
	41.03 Identify relationship between two entities by reading a given diagram.
	41.04 Create a relationship between instances of the same entity.
	41.05 Read an entity relationship model in order to validate it.
42.0	Demonstrate proficiency in early construction stages of the data modeling process by using unique identifiers and many-to-many (M:M) relationships for building entity relationship diagrams. The student will be able to:
	42.01 Identify the significance of an attribute that has more than one value for each entity instance.
	42.02 Evaluate appropriate methods of storing validation rules for attributes.
	42.03 Recognize unique identifiers inherited from other entities.
	42.04 Sequence the steps involved in resolving a many-to-many relationship.
43.0	Demonstrate proficiency in advanced data constructs by analyzing business requirements and diagramming entities and relationships. The student will be able to:
	43.01 Validate that an attribute is properly placed based upon its dependence on its entity's unique identifier (UID).
	43.02 Resolve many-to-many relationships with intersection entities.
	43.03 Model advanced data constructs including recursive relationships, subtypes, and exclusive relationships.
	43.04 Create exclusive entities and relationships by using subtypes and arcs, respectively.
	43.05 Identify initial layout for presentation and generate a list of action items for members of group.
	43.06 Develop an entity relationship model using subtypes, super-types and an exclusive arc.
44.0	Demonstrate proficiency in designing and adding complexity to a logical model. The student will be able to:
	44.01 Revise an entity relationship model according to client requirements.
	44.02 Define and give examples of hierarchical and recursive relationships.
	44.03 Differentiate between transferable and non-transferable relationships.
	44.04 Deliver a professional, formal business style presentation.
	44.05 Evaluate and critique presentation layout, design and performance.
	44.06 Construct a model using both recursion and hierarchies to express the same logical meaning.
45.0	Apply complex logical information by fine-tuning entities and the process for relating them. The student will be able to:
	45.01 Describe a relational database and how it differs from other database systems.
	45.02 Define primary keys and foreign keys and describe their purpose.
	45.03 Describe what data integrity refers to and list some constraints.

	45.04 Explain how database design fits into the database development process.
	45.05 Translate a logical model into a relational database design.
46.0	Apply initial database design and normalization by following the set of house rules that determine how items are stored and retrieved. The student will be able to:
	46.01 Demonstrate ability to implement steps for mapping entity relationship models for implementation.
	46.02 Document an initial database design on table instance charts.
	46.03 Recognize raw data and evaluate the steps for creating a data group in unnormalized form.
47.0	Demonstrate proficiency in the technique of normalization by labeling and organizing all items in a database in such a way as to prevent any confusion or mistakes. The student will be able to:
	47.01 Differentiate between normalized and unnormalized data.
	47.02 Move data from an unnormalized form through to a third normal form.
	47.03 Demonstrate ability to test data groups for third normal form compliance.
	47.04 Identify optimized data groups from given groups of normalized data.
48.0	Demonstrate proficiency in table normalization by combining the techniques of an entity relationship model or a top-down, business approach to data with normalization or a bottom-up mathematical approach to data. The student will be able to:
	48.01 Compare the normalization and logical techniques in terms of strengths and weaknesses.
	48.02 Further define normalization and explain its benefits.
	48.03 Place tables in third normal form.
	48.04 Explain how logical data modeling rules ensure normalized tables.
	48.05 Specify referential integrity constraints and design indices.
49.0	Apply blueprint principles to begin designing a tool for creating a web-based interface access to a database. The student will be able to:
	49.01 Evaluate the transformation of business requirements into an initial layout and design for a database.
	49.02 Construct simple webpage design for personal work folder.
	49.03 Evaluate existing websites and determine quality of design.
50.0	Extend the logical model presentation model by normalizing the data and mapping the management system. The student will be able to:
	50.01 Formulate a plan of action for the Database Project using skills previously learned in this course.
	50.02 Normalize a logical model to the third normal form (3NF).
	50.03 Create a table in the database using a database authoring tool.
	50.04 Demonstrate ability to edit tables using a database authoring tool.

	50.05 Create forms that will display the table components created with a database authoring tool.
51.0	Apply techniques for building a storage management system by creating a website using templates and wizards. The student will be able to:
	51.01 Create a website that displays the database project home.
	51.02 Link a website to create a web-enabled interface to the industry database.
	51.03 Edit the forms created and specify appropriate field labels for data entry.
52.0	Demonstrate design and functionality by constructing a group business presentation. The student will be able to:
	52.01 Evaluate and generate criteria for a formal, business presentation.
	52.02 Construct a persuasive group presentation using the guidelines set forth in class.
53.0	Demonstrate comprehension of database modeling competency through group presentation. The student will be able to:
	53.01 Deliver a formal business presentation for the class that discusses a logical model and initial database design.
	53.02 Demonstrate the functionality of the database and the layout/design capabilities of a database authoring tool.
	53.03 Prepare appropriate end-user documentation.
	53.04 Self-assess learning experience through the presentation and demonstration of their final database project.
54.0	Demonstrate comprehension that the database management software is a system for organizing the storage unit (or database) according to business needs and rules, through data integrity constraints. The student will be able to:
	54.01 Identify the structural elements of a relational database table.
	54.02 List and describe the system development life cycle.
	54.03 Describe the industry implementation of the relational database management system (RDBMS) and object relational database management system (ORDBMS).
	54.04 Explain how SQL and languages that extend SQL are used in the industry product set.
	54.05 Identify the advantages of a database management system.
55.0	Demonstrate comprehension of aspects of SQL language interface by writing basic SQL statements. The student will be able to:
	55.01 List the capabilities of SQL SELECT statements.
	55.02 Execute a basic SELECT statement.
	55.03 Differentiate between SQL statements and language commands that extend SQL.
56.0	Demonstrate proficiency working with columns, characters, and rows in SQL. The student will be able to:
	56.01 Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression.
	56.02 Use column aliases to rename columns in the query result.

	56.03 Eliminate duplicate rows in the query result.
	56.04 Display the structure of a table.
	56.05 Apply SQL syntax to restrict the rows returned from a query.
	56.06 Demonstrate application of the WHERE clause syntax.
	56.07 Construct and produce output using a SQL query containing character strings and date values.
57.0	Demonstrate proficiency in using SQL comparison operators. The student will be able to:
	57.01 Apply the proper comparison operator to return a desired result.
	57.02 Demonstrate proper use of BETWEEN, IN, and LIKE conditions to return a desired result.
	57.03 Distinguish between zero and the value of NULL as unavailable, unassigned, unknown, or inapplicable.
	57.04 Explain the use of comparison conditions and NULL.
58.0	Demonstrate proficiency in using logical comparisons and precedence rules. The student will be able to:
	58.01 Evaluate logical comparisons to restrict the rows returned based on two or more conditions.
	58.02 Apply the rules of precedence to determine the order in which expressions are evaluated and calculated.
	58.03 Construct a query to order a results set for single or multiple columns.
	58.04 Construct a query to sort a results set in ascending or descending order.
59.0	Demonstrate proficiency using SQL single row functions. The student will be able to:
	59.01 Perform calculations on data.
	59.02 Modify individual data items.
	59.03 Use character, number and date functions in SELECT statements.
	59.04 Format data and numbers for display purposes.
	59.05 Convert column data types.
60.0	Demonstrate proficiency displaying data from multiple tables. The student will be able to:
	60.01 Construct SELECT statements to access data from more than one table using equity and non-equality joins.
	60.02 Use outer joins through viewing data that generally does not meet a join condition.
	60.03 Join a table to itself.
61.0	Demonstrate proficiency aggregating data using group functions. The student will be able to:
	61.01 Identify the available group functions and describe their use.

	61.02 Demonstrate the ability to group data through the use of the GROUP BY clause.
	61.03 Demonstrate the ability to include or exclude grouped rows by using the HAVING clause.
62.0	Demonstrate proficiency utilizing subqueries. The student will be able to:
	62.01 Write a query with an embedded subquery.
	62.02 Evaluate and perform a multiple-column subquery.
	62.03 Describe and explain the behavior of subqueries when NULL values are retrieved.
	62.04 Create a subquery in a FROM clause.
63.0	Demonstrate proficiency producing readable output with SQL language interface, reporting tool, and data manipulation language. The student will be able to:
	63.01 Produce queries that require an input variable.
	63.02 Customize the SQL language interface and reporting environment using SET commands for control.
	63.03 Produce more readable output through the use of the column and break commands.
	63.04 Describe data manipulation language (DML) and describe various DML statements.
	63.05 Utilize data manipulation language (DML) through inserting, updating and deleting rows from a table.
	63.06 Control transactions using COMMIT and ROLLBACK statements.
64.0	Demonstrate proficiency creating and managing database objects. The student will be able to:
	64.01 Describe the main database objects.
	64.02 Create tables and alter their definitions.
	64.03 Describe the data types that can be used when specifying column definition.
65.0	Demonstrate proficiency altering tables and constraints implementing views. The student will be able to:
	65.01 Create, drop, rename and truncate tables using SQL.
	65.02 Identify and describe various constraints including not NULL, unique, primary key, foreign key, and check.
	65.03 Create and maintain constraints including adding, dropping, enabling, disabling, and cascading.
	65.04 Recognize views and explain how they are created, how they retrieve data and how they perform DML operations.
66.0	Demonstrate mastery of creating and implementing views, synonyms, indexes and other database objects. The student will be able to:
	66.01 Create views, retrieve data through a view, alter the definition of a view and drop a view.
	66.02 Categorize information by using Top-N queries to retrieve specified data.
	66.03 Identify the features of a sequence and display sequence values using a data dictionary view.

	66.04 Identify the characteristics of a cached sequence.
	66.05 Modify and remove a sequence using a SQL statement.
	66.06 Identify the features of private and public synonyms.
	66.07 Identify characteristics of an index and describe different types.
	66.08 Create and remove an index using a SQL statement.
67.0	Demonstrate ability to control user access and SQL language interface and reporting tool. The student will be able to:
	67.01 Identify the features of database security.
	67.02 Create users using SQL statements.
	67.03 Grant and revoke object privileges using a SQL language interface and reporting tool.
68.0	Demonstrate comprehension of bundling features of SQL. The student will be able to:
	68.01 List and describe the benefits of extension languages to SQL.
	68.02 Recognize the basic SQL block and its sections.
	68.03 Declare SQL variables and describe their significance.
	68.04 Execute a SQL block.
69.0	Demonstrate comprehension working with composite data types by writing executable script files. The student will be able to:
	69.01 Recognize the significance of the executable section and decide when to use it.
	69.02 Write statements in the executable section.
	69.03 Describe the rules of nested blocks.
	69.04 Identify and utilize appropriate coding conventions.
	69.05 Create a script that will insert, update, merge and delete data in a table.
70.0	Describe the differences between SQL and SQL extension languages. The student will be able to:
	70.01 Describe SQL extension languages.
	70.02 Differentiate between SQL and SQL extension languages.
	70.03 Explain the need for and benefits of SQL extension languages.
71.0	Create program blocks. The student will be able to:
	71.01 Describe the structure of a program block.
	71.02 Identify the different types of program blocks.

	71.03 Identify program programming environments.
	71.04 Create and execute an anonymous block.
	71.05 Output messages in program blocks.
72.0	Use variables in program blocks. The student will be able to:
	72.01 Describe how variables are used in program blocks.
	72.02 Identify the syntax for using variables.
	72.03 Declare and initialize variables.
	72.04 Assign new values to variables.
73.0	Recognize lexical units. The student will be able to:
	73.01 Describe the types of lexical units.
	73.02 Describe identifiers and identify valid and invalid identifiers.
	73.03 Describe and identify reserved words, delimiters, literals, and comments.
74.0	Recognize data types. The student will be able to:
	74.01 Describe the data type categories.
	74.02 Give examples of scalar, composite, and large object (LOB) data types.
	74.03 Identify when an object becomes eligible for garbage collection.
75.0	Use scalar data types. The student will be able to:
	75.01 Declare and use scalar data types.
	75.02 Define guidelines for declaring and initializing variables.
76.0	Use various types of joins. The student will be able to:
	76.01 Construct and execute SELECT statements using an equijoin.
	76.02 Construct and execute SELECT statements using a non-equijoin.
	76.03 Construct and execute SELECT statements using an outer join.
	76.04 Construct and execute SELECT statements that result in cross join.
77.0	Use SQL group functions and subqueries. The student will be able to:
	77.01 Construct and execute an SQL query using group functions to determine a sum total, an average amount, and a maximum value.
	77.02 Construct and execute an SQL query that groups data based on specified criteria.

	77.03 Construct and execute an SQL query that contains a WHERE clause using a single-row subquery.
	77.04 Construct and execute an SQL query that contains a WHERE clause using a multiple-row subquery.
78.0	Write executable statements. The student will be able to:
	78.01 Construct variable assignment statements.
	78.02 Construct statements using built-in SQL functions.
	78.03 Differentiate between implicit and explicit data type conversions.
	78.04 Describe when implicit data type conversions take place.
	78.05 List the drawbacks of implicit data type conversions.
	78.06 Construct statements using functions to explicitly convert data types.
	78.07 Construct statements using operators.
79.0	Use nested blocks and variable scope. The student will be able to:
	79.01 Understand the scope and visibility of variables.
	79.02 Write nested blocks and qualify variables with labels.
	79.03 Describe the scope of an exception.
	79.04 Describe the effect of exception propagation in nested blocks.
80.0	Use good programming practices. The student will be able to:
	80.01 List examples of good programming practices.
	80.02 Insert comments into code.
	80.03 Follow formatting guidelines when writing code.
81.0	Write DML statements to manipulate data. The student will be able to:
	81.01 Construct and execute a statement to insert data into a table.
	81.02 Construct and execute a statement to update data in a table.
	81.03 Construct and execute a statement to delete data from a table.
	81.04 Construct and execute a statement to merge data into a table.
82.0	Retrieve data. The student will be able to:
	82.01 Identify SQL statements that can be directly included in an executable block.
	82.02 Construct and execute an INTO clause to hold values returned by a single-row SELECT statement.

	82.03 Construct statements that retrieve data.
83.0	Manipulate data. The student will be able to:
	83.01 Describe when to use implicit or explicit cursors.
	83.02 Create code to use SQL implicit cursor attributes to evaluate cursor activity.
84.0	Use transaction control statements. The student will be able to:
	84.01 Define a transaction and give an example.
	84.02 Construct and execute a transaction control statement.
85.0	Use IF conditional control statements. The student will be able to:
	85.01 Construct and use an IF statement.
	85.02 Construct and use an IF -ELSIF statement.
	85.03 Create control statements to handle NULL conditions in an IF statement.
86.0	Use CASE conditional control statements. The student will be able to:
	86.01 Construct and use CASE statements.
	86.02 Construct and use CASE expressions.
	86.03 Include syntax to handle NULL conditions in a CASE statement.
	86.04 Include syntax to handle Boolean conditions in IF and CASE statements.
87.0	Use basic LOOP iterative control statements. The student will be able to:
	87.01 Describe the types of LOOP statements and their uses.
	87.02 Create a program containing a basic loop and an EXIT statement.
	87.03 Create a program containing a basic loop and an EXIT statement with conditional termination.
88.0	Use WHILE and FOR loop iterative control statements. The student will be able to:
	88.01 Construct and use the WHILE looping construct.
	88.02 Construct and use the FOR looping construct.
	88.03 Describe when a WHILE loop is used.
	88.04 Describe when a FOR loop is used.
89.0	Use nested loop iterative control statements. The student will be able to:
	89.01 Construct and execute a program using nested loops.

	89.02 Evaluate a nested loop construct and identify the exit point.
90.0	Use explicit cursors. The student will be able to:
	90.01 List the guidelines for declaring and controlling explicit cursors.
	90.02 Create code to open a cursor and fetch a piece of data into a variable.
	90.03 Use a simple loop to fetch multiple rows from a cursor.
	90.04 Create code to close a cursor.
91.0	Use explicit cursor attributes. The student will be able to:
	91.01 Define a record structure.
	91.02 Create code to process the row of an active set using record types in cursors.
	91.03 Use cursor attributes to retrieve information about the state of an explicit cursor.
92.0	Use cursor FOR loops. The student will be able to:
	92.01 List and explain the benefits of using a cursor FOR loops.
	92.02 Create code to declare a cursor and manipulate it in a FOR loop.
	92.03 Create code containing a cursor FOR loop using a subquery.
93.0	Use cursors with parameters. The student will be able to:
	93.01 List the benefits of using parameters with cursors.
	93.02 Create code to declare and manipulate a cursor with a parameter.
94.0	Use cursors for update transactions. The student will be able to:
	94.01 Create code to lock rows before an update using the appropriate clause.
	94.02 Explain the effect of using NOWAIT in an update cursor declaration.
	94.03 Create code to use the current row of the cursor in an UPDATE or DELETE statement.
95.0	Use multiple cursors. The student will be able to:
	95.01 Explain the need for using multiple cursors to produce multilevel reports.
	95.02 Create code to declare and manipulate multiple cursors within nested loops.
	95.03 Create code to declare and manipulate multiple cursors using parameters.
96.0	Handle exceptions. The student will be able to:
	96.01 Describe the advantages of including exception handling code.

	96.02 Describe the purpose of an EXCEPTION section in a program block.
	96.03 Create code to include an EXCEPTION section.
	96.04 List the guidelines for exception handling.
97.0	Trap server exceptions. The student will be able to:
	97.01 Distinguish between errors defined by the server and those defined by the programmer.
	97.02 Differentiate between errors that are handled implicitly and explicitly by the server.
	97.03 Write code to trap a predefined server error.
	97.04 Write code to trap a non-predefined server error.
	97.05 Write code to identify an exception by error code and by error message.
98.0	Trap user-defined exceptions. The student will be able to:
	98.01 Write code to name a user-defined exception.
	98.02 Write code to raise an exception.
	98.03 Write code to handle a raised exception.
99.0	Create procedures. The student will be able to:
	99.01 Differentiate between anonymous blocks and subprograms.
	99.02 Identify the benefits of using subprograms.
	99.03 Describe a stored procedure.
	99.04 Create a procedure.
	99.05 Describe how a stored procedure is invoked.
100.0	Use parameters in procedures. The student will be able to:
	100.01 Describe how parameters contribute to a procedure.
	100.02 Define a parameter.
	100.03 Create a procedure using a parameter.
	100.04 Invoke a procedure that has parameters.
	100.05 Distinguish between formal and actual parameters.
101.0	Pass parameters. The student will be able to:
	101.01 List the types of parameter modes.

	101.02 Create a procedure that passes parameters.
	101.03 Identify methods for passing parameters.
	101.04 Describe the default option for parameters.
102.0	Create stored functions. The student will be able to:
	102.01 Describe the difference between a stored procedure and a stored function.
	102.02 Create a program block containing a function.
	102.03 Identify ways in which functions may be invoked.
	102.04 Create a program block that invokes a function that has parameters.
103.0	Use functions in SQL statements. The student will be able to:
	103.01 Describe where user-defined functions can be called from within an SQL statement.
	103.02 Describe the restrictions on calling functions from SQL statements.
	103.03 Describe the purpose of the Data Dictionary.
	103.04 Differentiate different types of Data Dictionary views.
	103.05 Write SQL SELECT statements to retrieve information from the Data Dictionary.
104.0	Manage procedures and functions. The student will be able to:
	104.01 Describe how exceptions are propagated.
	104.02 Remove a function and a procedure.
	104.03 Use Data Dictionary views to identify and manage stored procedures.
105.0	Manage object privileges. The student will be able to:
	105.01 List and explain several object privileges.
	105.02 Explain the function of the EXECUTE object privilege.
	105.03 Write SQL statements to grant and revoke object privileges.
106.0	Use invoker’s rights. The student will be able to:
	106.01 Contrast invoker’s rights with definer’s rights.
	106.02 Create a procedure that uses invoker’s rights.
107.0	Create packages. The student will be able to:
	107.01 Describe a package, its components, and the reasons for use.

	107.02 Create packages containing related variables, cursors, constants, exceptions, procedures, and functions.
	107.03 Create a program block that invokes a package construct.
108.0	Manage package constructs. The student will be able to:
	108.01 Explain the difference between public and private package constructs.
	108.02 Designate a package construct as either public or private.
	108.03 Specify the syntax to drop a package.
	108.04 Identify Data Dictionary views used to manage packages.
	108.05 Identify the guidelines for using packages.
109.0	Use advanced package concepts. The student will be able to:
	109.01 Write packages that use the overloading feature.
	109.02 Write packages that use forward declarations.
	109.03 Explain the purpose of a package initialization block.
	109.04 Identify restrictions on using packaged functions in SQL statements.
110.0	Manage persistent state of package variables. The student will be able to:
	110.01 Identify persistent states of package variables.
	110.02 Control the persistent state of a package cursor.
111.0	Use vendor-supplied packages. The student will be able to:
	111.01 Describe common uses for vendor-supplied packages.
	111.02 Use the syntax to specify messages for a vendor-supplied package.
	111.03 Identify the exceptions used in conjunction with vendor-supplied packages.
112.0	Understand dynamic SQL. The student will be able to:
	112.01 Identify the stages through which all SQL statements pass.
	112.02 Describe the reasons for using dynamic SQL to create an SQL statement.
	112.03 List statements supporting Native Dynamic SQL.
113.0	Understand triggers. The student will be able to:
	113.01 Describe database triggers and their uses.
	113.02 Differentiate between a database trigger and an application trigger.

	113.03 List the guidelines for using triggers.
	113.04 Compare and contrast database triggers and stored procedures.
114.0	Create DML triggers. The student will be able to:
	114.01 Create a DML trigger and identify its components.
	114.02 Create a statement level trigger.
	114.03 Describe the trigger firing sequence options.
	114.04 Create a DML trigger that uses conditional predicates.
	114.05 Create a row level trigger.
	114.06 Create a row level trigger that uses OLD and NEW qualifiers.
	114.07 Create an INSTEAD OF trigger.
115.0	Create DDL and database event triggers. The student will be able to:
	115.01 Describe the events that cause DDL and database event triggers to fire.
	115.02 Create a trigger for a DDL statement.
	115.03 Create a trigger for a database event.
	115.04 Describe the functionality of the CALL statement.
	115.05 Describe the cause of a mutating table.
116.0	Manage triggers. The student will be able to:
	116.01 View trigger information in the Data Dictionary.
	116.02 Disable and enable a database trigger.
	116.03 Remove a trigger from the database.
117.0	Use large object data types. The student will be able to:
	117.01 Compare and contrast LONG and LOB data types.
	117.02 Describe LOB data types and how they are used.
	117.03 Differentiate between internal and external LOBs.
	117.04 Create and maintain LOB data types.
	117.05 Migrate data from LONG to LOB.
118.0	Manage binary types. The student will be able to:

	118.01 Define binary column data type.
	118.02 Create directory objects and view them in the Data Dictionary.
	118.03 Manage and manipulate binary types.
119.0	Manage indexes. The student will be able to:
	119.01 Create and manipulate user-defined records.
	119.02 Create an index.
	119.03 Describe the difference between records, tables, and indexes.
120.0	Manage dependencies. The student will be able to:
	120.01 Describe the implications of procedural dependencies.
	120.02 Contrast dependent objects and referenced objects.
	120.03 View dependency information in the Data Dictionary.
	120.04 Use a script to create the objects required to display dependencies.
	120.05 Use views to display dependencies.
	120.06 Describe how to minimize dependency failures.
121.0	Demonstrate an understanding of Agile Development. The student will be able to:
	121.01 Compare Agile project development to the waterfall approach.
	121.02 Describe the Agile manifesto and the 12 principles.
	121.03 Describe the benefits of Agile development.
122.0	Program a database application. The student will be able to:
	122.01 Utilize loop statements.
	122.02 Given a scenario, use arithmetic, comparison, and pattern-matching operators.
	122.03 Create user-defined functions.
	122.04 Utilize common built-in functions.
	122.05 Declare variables in modules and procedures.
	122.06 Declare arrays, and initialize elements of arrays.
	122.07 Declare and use object variables and collections, and use their associated properties and methods.
	122.08 Declare symbolic constants, and make them available locally or publicly.

	122.09 Respond to events.
123.0	Utilize the basic concepts of database design. The student will be able to:
	123.01 Apply basic concepts of normalization.
	123.02 Utilize the cascade update and cascade delete options.
124.0	Utilize SQL and union queries. The student will be able to:
	124.01 Utilize SQL to write common queries.
	124.02 Refer to objects by using SQL.
	124.03 Utilize union queries.
125.0	Implement program statements using objects. The student will be able to:
	125.01 Determine when to use data access objects.
	125.02 Differentiate between objects and collections.
	125.03 Write statements that access and modify database objects.
	125.04 Utilize data access objects.
	125.05 Select appropriate methods and property settings for use with specified objects.
126.0	Utilize debugging tools and write error handlers. The student will be able to:
	126.01 Trap errors.
	126.02 Utilize debugging tools to suspend program execution, and to examine, step through, and reset execution of code.
	126.03 Debug code samples.
	126.04 Utilize the Debugger to monitor variable values.
	126.05 Write an error handler.
127.0	Demonstrate file I/O. The student will be able to:
	127.01 Read from files.
	127.02 Write to files.
	127.03 Utilize record locking.
128.0	Create forms and identify all the properties of a form. The student will be able to:
	128.01 Choose form-specific and report-specific properties to set.
	128.02 Choose control properties to set.

	128.03 Assign event-handling procedures to controls in a form.
	128.04 Define and create form and report modules.
	128.05 Identify the scope of a form or report module.
	128.06 Open multiple instances of a form, and refer to them.
	128.07 Assign values to form properties.
	128.08 Use form methods.
129.0	Manipulate data using object models. The student will be able to:
	129.01 Connect to a data source.
	129.02 Open a recordset.
	129.03 Insert, update, merge and delete data.
130.0	Develop custom controls. The student will be able to:
	130.01 Set properties for custom controls.
	130.02 Customize user interface controls.
131.0	Utilize API functions. The student will be able to:
	131.01 Properly declare functions.
	131.02 Use the by value and by reference parameters.
132.0	Demonstrate and implement database replication using programming tools. The student will be able to:
	132.01 Make a database replicable.
	132.02 View a synchronization schedule.
	132.03 Explain how synchronization conflicts are resolved.
	132.04 Identify the advantages of using replication of synchronization.
	132.05 Identify the changes that the database engine makes when it converts a nonreplicable database into replicable database.
133.0	Analyze and implement security options. The student will be able to:
	133.01 Analyze a scenario, and recommend an appropriate type of security.
	133.02 Explain the steps for implementing security.
	133.03 Analyze code to ensure that it sets security options.
	133.04 Write code to implement security options.

134.0	Implement client/server applications. The student will be able to:
	134.01 Demonstrate SQL pass through queries and application queries.
	134.02 Access external data.
	134.03 Trap errors that are generated by the server.
	134.04 Optimize connections.
	134.05 Optimize performance for a given client/server application.
135.0	Optimize the performance of a database. The student will be able to:
	135.01 Differentiate between single-field and multiple-field indexes.
	135.02 Optimize queries.
	135.03 Restructure queries to allow faster execution.
	135.04 Optimize performance in distributed applications.
	135.05 Optimize performance for client/server applications.
136.0	Perform application distribution. The student will be able to:
	136.01 Prepare an application for distribution.
	136.02 Analyze various methods to distribute a client/server application.
	136.03 Distribute custom controls with an application.
	136.04 Provide online help.
137.0	Test and debug databases. The student will be able to:
	137.01 Implement error handling.
	137.02 Test and debug library databases.
138.0	Describe the difference between relational and NoSQL databases. The student will be able to:
	138.01 Describe the advantages and disadvantages of NoSQL databases.
	138.02 Describe the types of NoSQL databases (e.g., key-value store, column-based, graph-based, document-based).
	138.03 Describe when a NoSQL database should be used for storage.
139.0	Demonstrate an understanding of Data Science and the concept of Data mining. The student will be able to:
	139.01 Define Data Science.
	139.02 Define Data Mining.

139.03	Describe and compare Structured Data and Non-Structured Data.
139.04	Describe and model the Data Science Life Cycle.
139.05	Describe and compare various Deep Learning Frameworks available to Data Science.
139.06	Describe and compare Data Science and Data Analytics.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: .NET Application Development & Programming
Program Type: Career Preparatory
Career Cluster: Information Technology

Career Certificate Program		
Program Number	Y700400	
CIP Number	0511020314	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation: 9	Communication (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating .NET-based applications, including testing, monitoring, debugging, documenting, and maintaining .NET applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points, with OCPs A, B, C and D.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CTS0041	Computer Programmer Assistant	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	300 hours
C	CTS0044	Computer Programmer		150 hours
D	CTS0032	.NET Programmer		450 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
17.0 Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development.
18.0 Demonstrate an understanding of the characteristics, use and selection of numerical, non-numerical and logical data types.
19.0 Distinguish between iterative and non-iterative program control structures.
20.0 Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted and translated programming languages.
21.0 Describe the processes, methods and conventions for software development and maintenance.
22.0 Explain the types, uses, and limitations of testing for ensuring quality control.
23.0 Create a program design document using Unified Modeling Language (UML) or other common design tool.
24.0 Solve problems using critical thinking skills, creativity and innovation.
25.0 Use information technology tools.
26.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
27.0 Design a computer program to meet specific physical, operational and interaction criteria.
28.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
29.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate and process user input.

30.0 Effectively communicate and collaborate.
31.0 Demonstrate responsible use of technology and information.
32.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
33.0 Create a project plan that defines requirements, structural design, time estimates and testing elements.
34.0 Design, document and create object-oriented computer programs.
35.0 Design a unit test plan for an object-oriented computer program, test and debug the program and report the results.
36.0 Understand human interactions in intelligence.
37.0 Develop an awareness of the changes taking place in the information age and how they fit into an evolving society.
38.0 Understand .NET primitive data types and their uses.
39.0 Describe the types and characteristics of lexical units in the .NET programming language.
40.0 Construct statements that use various .NET operators.
41.0 Construct and use .NET selection control structures.
42.0 Construct and use .NET iterative control structures.
43.0 Construct and use .NET structures for error handling.
44.0 Write .NET programs that define and use user-defined data types, including classes.
45.0 Write .NET programs that define and use methods.
46.0 Write programs that perform console input and output in a .NET program.
47.0 Use namespaces in a .NET program.
48.0 Use arrays in .NET programs.
49.0 Write .NET programs that use the object-oriented concept of inheritance.
50.0 Write .NET programs that use the object-oriented concept of polymorphism.
51.0 Write .NET programs that use the object-oriented concept of encapsulation.
52.0 Apply common programming style guidelines and conventions.
53.0 Use application life cycle management to develop and maintain .NET programs.
54.0 Use nullable values in a .NET program.
55.0 Use the .NET String and StringBuilder classes in an application.
56.0 Use .NET classes to perform stream input/output.
57.0 Use recursive functions to solve problems in .NET programs.
58.0 Write .NET programs that use interfaces.
59.0 Use .NET collections in applications.
60.0 Demonstrate knowledge of different types of .NET applications.
61.0 Demonstrate knowledge of .NET architecture and tools.
62.0 Demonstrate knowledge of web applications.
63.0 Develop webpages using HTML, CSS, JavaScript and ASP.NET.
64.0 Develop .NET Windows Form applications.
65.0 Develop Windows Service applications and class libraries.
66.0 Demonstrate knowledge of database applications.
67.0 Demonstrate knowledge of structured query language (SQL) statements.
68.0 Develop .NET database applications.
69.0 Successfully work as a member of a software development team.

70.0 Manage time according to a plan.
71.0 Keep acceptable records of progress problems and solutions.
72.0 Plan, organize and carry out a project plan.
73.0 Manage resources.
74.0 Use tools, materials and processes in an appropriate and safe manner.
75.0 Demonstrate an understanding of the software development process.
76.0 Research content related to the project and document the results following industry conventions.
77.0 Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience.
78.0 Demonstrate competency in the area of expertise related to developing computer software using the .NET framework.

Florida Department of Education
Student Performance Standards

Program Title: .NET Application Development & Programming
Career Certificate Program Number: Y700400

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)
Course Number: CTS0041 **Occupational Completion Point: B** **Computer Programmer Assistant – 300 Hours**
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
16.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
16.02 Locate, organize and reference written information from various sources.
16.03 Construct writings and/or communications using developmentally appropriate terminology.
16.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
16.05 Analyze the positive and negative impacts of technology on popular culture and personal life.
16.06 Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
16.07 Evaluate ways in which adaptive technologies may assist users with special needs.
16.08 Explain how societal and economic factors are affected by access to critical information.
16.09 Discuss the challenges (e.g., political, social, and economic) in providing equal access and distribution of technology in a global society.
17.0 Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development. The student will be able to:
17.01 Explore a variety of careers to which computing is central.
17.02 Compare and contrast appropriate and inappropriate social networking behaviors.
17.03 Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, cloud computing).

	17.04 Evaluate the impacts of irresponsible use of information (e.g., plagiarism, falsification of data) on collaborative projects.
	17.05 Identify tasks performed by programmers.
	17.06 Describe how businesses use computer programming to solve business problems.
	17.07 Investigate job opportunities in the programming field.
	17.08 Explain different specializations and the related training in the computer programming field.
	17.09 Explain the need for continuing education and training of computer programmers.
	17.10 Understand and identify ways to use technology to support lifelong learning.
	17.11 Explain enterprise software systems and how they impact business.
	17.12 Describe ethical responsibilities of computer programmers.
	17.13 Describe the role of customer support to software program quality.
	17.14 Identify credentials and certifications that may improve employability for a computer programmer.
	17.15 Identify devices, tools, and other environments for which programmers may develop software.
18.0	Demonstrate an understanding of the characteristics, use and selection of numerical, non-numerical and logical data types. The student will be able to:
	18.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	18.02 Explain the types and uses of variables in programs.
	18.03 Determine the best data type to use for given programming problems.
	18.04 Compare and contrast simple data structures and their uses.
	18.05 Identify the types of operations that can be performed on different data types.
	18.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	18.07 Explain how computers store different data types in memory.
	18.08 Demonstrate the difference between "data" and "information".
	18.09 Use different number systems to represent data.
	18.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	18.11 Use Boolean logic to perform logical operations.
19.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	19.01 Create non-iterative programming structures and explain their uses.
	19.02 Create iterative programming structures and explain their uses.

	19.03	Explain how sequence, selection, and iteration are building blocks of algorithms.
20.0	Differentiate among procedural, object-oriented, compiled, interpreted and translated programming languages. The student will be able to:	
	20.01	Differentiate between multiple levels of an operating system, translation and interpretation that support program execution.
	20.02	Explain the program execution process (by an interpreter and in CPU hardware).
	20.03	Describe object-oriented concepts.
	20.04	Explain the characteristics of procedural and object-oriented programming languages.
	20.05	Compare and contrast programming languages that are compiled, interpreted and translated.
	20.06	Classify programming languages by paradigm and application domain (e.g., imperative, functional, logic languages and how well suited they are for certain application domains such as web programming, symbolic processing, data/numerical processing).
21.0	Describe the processes, methods and conventions for software development and maintenance. The student will be able to:	
	21.01	Describe a software development process that is used to solve problems at different software development stages.
	21.02	Describe and demonstrate ethical and responsible use of modern communication media and devices.
	21.03	Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).
	21.04	List and explain the steps in the program development cycle.
	21.05	Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	21.06	Describe different methods used to facilitate version control.
22.0	Explain the types, uses and limitations of testing for ensuring quality control. The student will be able to:	
	22.01	Explain the uses and limits of testing in ensuring program quality.
	22.02	Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	22.03	Describe and identify types of programming errors.
	22.04	Analyze and manipulate data collected by a variety of data collection techniques.
	22.05	Explain what tools are applied to provide automated testing environments.
23.0	Create a program design document using common design tool. The student will be able to:	
	23.01	Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	23.02	Describe tools for developing a program design (e.g., Unified Modeling Language, flowcharts, design documents, pseudocode).
	23.03	Explain the role of existing libraries and packages in facilitating programmer productivity.
	23.04	Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML,

		flowcharts, design documents, pseudocode).
	23.05	Write a program design document using standard design methodology.
	23.06	Define input and output for a program module using standard design methodology.
24.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:	
	24.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
	24.02	Employ critical thinking and interpersonal skills to resolve conflicts.
	24.03	Identify and document workplace performance goals and monitor progress toward those goals.
	24.04	Conduct technical research to gather information necessary for decision-making.
	24.05	Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
25.0	Use information technology tools. The student will be able to:	
	25.01	Use personal information management (PIM) applications to increase workplace efficiency.
	25.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email and internet applications.
	25.03	Employ computer applications to access, create, manage, integrate and store information.
	25.04	Employ collaborative/groupware applications to facilitate group work.
	25.05	Use a development process in creating a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data).
26.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:	
	26.01	Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	26.02	Discuss the impact of government regulation on privacy and security.
	26.03	Describe how different types of software licenses (e.g., open source, proprietary licenses) can be used to share and protect intellectual property.
	26.04	Explain how access to information may not include the right to distribute the information.
	26.05	Describe differences between open source, freeware and proprietary software licenses, and how they apply to different types of software.
	26.06	Discuss security and privacy issues that relate to computer networks.
	26.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts and harassment.
27.0	Design a computer program to meet specific physical, operational, and interaction criteria. The student will be able to:	

	27.01	Choose appropriate data types depending on the needs of the program.
	27.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
	27.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
	27.04	Compare techniques for analyzing massive data collections.
	27.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
	27.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
	27.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
	27.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
	27.09	Use an industrial-strength integrated development environment to implement a program.
28.0		Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:
	28.01	Use appropriate naming conventions to define program variables and methods.
	28.02	Use a program editor to write the source code for a program.
	28.03	Write programs that use selection structures.
	28.04	Write programs that use repetition structures.
	28.05	Write programs that use nested structures.
	28.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.
	28.07	Compile, run, test and debug programs.
	28.08	Write programs that use standard arithmetic operators with different numerical data types.
	28.09	Write programs that use standard logic operators.
	28.10	Write programs that use a variety of common data types.
	28.11	Write programs that perform data conversion between standard data types.
	28.12	Write programs that define, use, search and sort arrays.
	28.13	Write programs that use user-defined data types.
	28.14	Demonstrate understanding and use of appropriate variable scope.
	28.15	Explain recursive programming structure.

	28.16 Use global and local scope appropriately in program implementation.
29.0	Create and document an interactive computer program that employs functions, subroutines or methods to receive, validate and process user input. The student will be able to:
	29.01 Critically examine classical algorithms and implement an original algorithm.
	29.02 Write programs that perform user input and output.
	29.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	29.04 Write program modules such as functions, subroutines or methods.
	29.05 Write program modules that accept arguments.
	29.06 Write program modules that return values.
	29.07 Write program modules that validate arguments and return error codes.
	29.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	29.09 Use APIs and libraries to facilitate programming solutions.
	29.10 Participate in a peer code review to verify program functionality, programming styles, program usability and adherence to common programming standards.
30.0	Effectively communicate and collaborate. The student will be able to:
	30.01 Evaluate modes of communication and collaboration.
	30.02 Select appropriate tools within a project environment to communicate with project team members.
	30.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project.
	30.04 Generate, evaluate and prioritize questions that can be researched through digital resources and online tool.
	30.05 Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
	30.06 Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
31.0	Demonstrate responsible use of technology and information. The student will be able to:
	31.01 Explain the principles of cryptography by examining encryption, digital signatures and authentication methods (e.g. explain why and how certificates are used with https for authentication and encryption).
	31.02 Implement an encryption, digital signature, or authentication method.
	31.03 Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people.

Course Number: CTS0044 Occupational Completion Point: C Computer Programmer – 150 Hours	
32.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
32.01	Demonstrate the understanding and use of classes, objects, attributes and behaviors.
32.02	Demonstrate the understanding and use of inheritance.
32.03	Demonstrate the understanding and use of data encapsulation.
32.04	Demonstrate the understanding and use of polymorphism.
32.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
33.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates and testing elements. The student will be able to:
33.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program, and testing it.
33.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements and other common components of a requirements document.
33.03	Design an object-oriented program using standard design methodology.
33.04	Work with other team members to develop a project plan for a program.
33.05	Work with other team members to write a design document for a program with multiple functions and shared data.
33.06	Participate in design meetings that review program design documents for conformance to program requirements.
33.07	Estimate the time to develop a program or module.
33.08	Evaluate algorithms by their efficiency, correctness and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets and by debugging).
34.0	Design, document, and create object-oriented computer programs. The student will be able to:
34.01	Compare and contrast recursive functions to iterative methods.
34.02	Understand the implementation of character strings in the programming language.
34.03	Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
34.04	Write programs that implements user-defined data types.
34.05	Decompose a problem by defining new functions and classes.
34.06	Write object-oriented programs that implement inheritance.
34.07	Write object-oriented programs that implement polymorphism.
34.08	Develop class constructors.

	34.09	Write programs that define and use program constants.
	34.10	Write programs that perform error handling.
	34.11	Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity and conformance to program design documents.
	34.12	Describe the concept of parallel processing as a strategy to solve large problems.
	34.13	Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	34.14	Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	34.15	Write programs that use complex data structures (e.g., stacks, queues, trees, linked list).
	34.16	Write programs that are event-driven.
	34.17	Write programs that perform file input and output (i.e., sequential and random access file input/output).
	34.18	Explain intractable problems and understand that problems exists that are computationally unsolvable (undecidable) (e.g., classic intractable problems include Towers of Hanoi, TSP).
	34.19	Explain the value of heuristic algorithms to approximate solutions for intractable problems (e.g., a heuristic solution to TSP).
35.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:	
	35.01	Develop a test plan for an object-oriented program.
	35.02	Write test plans for event-driven programs.
	35.03	Write test plans for programs that perform file input and output.
	35.04	Perform test and debug activities on object-oriented programs, including those written by someone else.
	35.05	Perform test and debug activities on an event-driven program.
	35.06	Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	35.07	Document the findings of testing in a test report.
36.0	Understand human interactions in intelligence. The student will be able to:	
	36.01	Describe the unique features of computers embedded in mobile devices and vehicles.
	36.02	Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.
	36.03	Describe the process of designing software to support specialized forms of human-computer interaction.
	36.04	Explain the notion of intelligent behavior through computer modeling and robotics.
	36.05	Describe common measurements of machine intelligence (e.g., Turing test).
	36.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception,

	machine learning).
36.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space and automotive fields.
Course Number: CTS0032 Occupational Completion Point: D .NET Programmer – 450 Hours	
37.0	Develop an awareness of the changes taking place in the information age and how they fit into an evolving society. The student will be able to:
37.01	Cite examples of jobs, salary and opportunities he/she will have as a .NET programmer.
37.02	Describe the role a database plays in a business.
37.03	Explain the value of middleware, such as the .NET framework, in developing software applications.
37.04	Understand the importance of clear communication when discussing business informational requirements.
38.0	Understand .NET primitive data types and their uses. The student will be able to:
38.01	Describe how variables are used in programs.
38.02	Identify the .NET built-in value types, their uses, and the ranges of values supported by each type.
38.03	Identify the default values for built-in value types.
38.04	Write statements that declare and initialize variables.
38.05	Write statements that assign literal values to numeric types.
38.06	Identify the .NET built-in reference types.
38.07	Write statements that assign string literals to string types.
38.08	Explain the memory size requirements for the various data storage types.
38.09	Identify which types are stored on the heap and which are stored on the stack.
38.10	Identify which data type should be used for a given purpose in a program.
38.11	Write statements that create variables with values that cannot be changed (i.e., const, final).
38.12	Identify the syntax for declaring and initializing each of the built-in data types.
38.13	Differentiate between implicit and explicit data type conversions.
38.14	Describe when implicit data type conversions take place.
38.15	Write statements that use explicit type conversion.

	38.16 List the drawbacks of implicit data type conversions.
	38.17 Compare and contrast boxing and unboxing.
	38.18 Describe the scope of a variable.
	38.19 Describe how the compiler uses scope to distinguish between variables with the same name.
39.0	Describe the types and characteristics of lexical units in the .NET programming language. The student will be able to:
	39.01 Describe the types of lexical units (e.g., keywords, directives, operators).
	39.02 Describe identifiers and identify valid and invalid identifiers.
	39.03 Describe and identify reserved words, delimiters, literals and comments.
40.0	Construct statements that use various .NET operators. The student will be able to:
	40.01 Construct statements using arithmetic operators.
	40.02 Construct statements using relational operators.
	40.03 Construct and use statements using logical operators.
	40.04 Construct and use statements using assignment operators.
	40.05 Construct and execute statements using operator precedence.
	40.06 Construct and execute statements using methods and fields of the math class.
41.0	Construct and use .NET selection control structures. The student will be able to:
	41.01 Construct and use an if structure in a program.
	41.02 Construct and use an if/else structure in a program.
	41.03 Construct and use multiple-selection structures (e.g., switch, elseif, select) in programs.
	41.04 Construct and use nested selection structures in a program.
	41.05 Construct and use a conditional operator.
42.0	Construct and use .NET iterative control structures. The student will be able to:
	42.01 Describe the types of iterative control structures and their uses.
	42.02 Construct and use a while structures (e.g., while, do/while, do/until) in a program.
	42.03 Construct and use a for structure in a program.
	42.04 Construct and use a control structure that iterates over each item in a collection (e.g., foreach, for/each/next).
	42.05 Describe the limits and advantages of different iterative control structure (i.e., while, do/while, for, foreach or for/each).

	42.06	Construct and use nested structures (iterative and selective) in a program.
	42.07	Write programs that alter the execution of program loops (e.g., break, continue, exit).
43.0	Construct and use .NET structures for error handling. The student will be able to:	
	43.01	Describe the different types of software errors.
	43.02	Compare and contrast alternatives for handling errors.
	43.03	Write programs that validate user input and handle errors.
	43.04	Explain the correct method for using multiple catch blocks for exceptions.
	43.05	Explain the purpose of the finally block in exception handling.
	43.06	Write programs that handle exceptions using the try/catch/finally structure.
	43.07	Write programs with nested exception handling.
	43.08	Explain the concept of structured exception handling.
	43.09	Identify common exceptions and their causes.
	43.10	Explain the concept of throwing a new exception.
	43.11	Write programs that catch and re-throw exceptions.
	43.12	Write exception handlers that use characteristics of the exception argument in the program.
44.0	Write .NET programs that define and use user-defined data types, including classes. The student will be able to:	
	44.01	Explain the concept of a user-defined data type.
	44.02	Distinguish between structures and classes.
	44.03	Identify the syntax for declaring enumerations and structures.
	44.04	Write programs that use declare and use enumerations.
	44.05	Write programs that declare and use structures.
	44.06	Explain the characteristics of different class constructs including instance variables, properties, fields, methods, events, object references and constructors.
	44.07	Write programs that declare and use classes.
	44.08	Distinguish between different types of classes, including base class, derived class, abstract class and sealed class.
	44.09	Explain the impact of using different access modifiers on user-defined data types.
	44.10	Use access modifiers in a program to control visibility to variables and user-defined data types.
	44.11	Explain the “this” reference and its uses.

45.0	Write .NET programs that define and use methods. The student will be able to:
	45.01 Identify the benefits of using methods.
	45.02 Describe the different types of class methods and their purposes.
	45.03 Create class methods that do and do not return values.
	45.04 Write statements that invoke a method.
	45.05 Create a method using arguments.
	45.06 Invoke a method that has arguments.
	45.07 Describe a method signature.
	45.08 Describe the purpose of overloading methods.
	45.09 Write programs that have overloaded methods.
	45.10 Define methods that have default arguments.
	45.11 Describe the conflict between overloaded methods and default arguments.
	45.12 Explain the impact of using different access modifiers on class methods.
	45.13 Write methods that use argument modifiers (e.g., out, ref, byref, byval, const).
46.0	Write programs that perform console input and output in a .NET program. The student will be able to:
	46.01 Use the Console class to read and write data from the console.
	46.02 Write statements that use escape sequences.
	46.03 Write statements that format string and numeric output.
	46.04 Write statements that use the ToString method to output data.
47.0	Use namespaces in a .NET program. The student will be able to:
	47.01 Compare and contrast assemblies and namespaces.
	47.02 Describe the use of namespaces in .NET programming.
	47.03 Describe commonly used .NET namespaces (e.g., System, System.IO, System.Collections, System.Drawing).
	47.04 Identify the correct namespace to include for specified classes.
	47.05 Write programs that define a namespace.
	47.06 Create namespaces that abide by standard naming convention.
48.0	Use arrays in .NET programs. The student will be able to:

	48.01 Write statements to declare and initialize an array.
	48.02 Demonstrate the use of initializer lists.
	48.03 Write methods that take an array as an argument.
	48.04 Write methods that return an array to the calling method.
	48.05 Write statements to update and destroy arrays.
	48.06 Explain linear and binary searching.
	48.07 Use the static methods of the Array class to perform searches, binary searches and sorts.
	48.08 Demonstrate the use of multidimensional arrays.
	48.09 Demonstrate the use of jagged arrays (array of arrays).
49.0	Write .NET programs that use the object-oriented concept of inheritance. The student will be able to:
	49.01 Explain the purpose and use of inheritance in object oriented programming.
	49.02 Compare and contrast single and multiple inheritance.
	49.03 Explain the purpose and implementation of classes that cannot serve as a base class (a sealed class).
	49.04 Describe has-a and is-a relationships.
	49.05 Create class hierarchies using inheritance.
	49.06 Declare and use a class derived from another class (implementing an is-a relationship).
	49.07 Declare and use a class where the derived class overrides methods of the base class.
	49.08 Declare and use a class that contains another class as a data member (implementing a has-a relationship).
	49.09 Write statements that determine at run time whether an instance of a class is derived from a specific base class or interface.
	49.10 Write statements that invoke a method of the base class from a derived class.
	49.11 Identify which class methods can be inherited and which cannot.
	49.12 Explain how access modifiers affect the inheritance of class variables and methods.
50.0	Write .NET programs that use the object-oriented concept of polymorphism. The student will be able to:
	50.01 Explain the purpose and implementation of classes that cannot be instantiated (an abstract class).
	50.02 Explain the purpose and implementation of virtual class methods that must be overridden by derived classes.
	50.03 Explain the use of abstract classes in enforcing polymorphism.
	50.04 Create an abstract class.

	50.05 Create classes that derive from an abstract class.
	50.06 Create a program that uses polymorphism.
51.0	Write .NET programs that use the object-oriented concept of encapsulation. The student will be able to:
	51.01 Define and use classes that use access modifiers (e.g., private, public, protected, internal, internal protected) to provide encapsulation of data.
	51.02 Explain the restrictions on using accessibility levels.
	51.03 Compare and contrast different types of variable scope, including block, procedure, module/class and project scope.
	51.04 Compare and contrast different types of method scope, including public, private, protected, friend and protected friend.
	51.05 Write programs that use local variables.
	51.06 Describe the scope of a given variable.
	51.07 Describe how the compiler uses scope to distinguish between variables with the same name.
	51.08 Explain the purpose and use of static classes, variables and methods.
	51.09 Write programs that create and use static classes, variables and methods.
52.0	Apply common programming style guidelines and conventions. The student will be able to:
	52.01 List examples of good programming practices.
	52.02 Insert comments into code.
	52.03 Follow formatting guidelines when writing code.
	52.04 Define guidelines for declaring and initializing variables.
53.0	Use application life cycle management to develop and maintain .NET programs. The student will be able to:
	53.01 Describe the stages in the life cycle of an application.
	53.02 Describe tools used to manage each stage in the life cycle of an application and how each is used to ensure the integrity of the product.
	53.03 Describe how the needs of the customer affect the development of an application.
	53.04 Describe the different types of testing that are performed on an application.
	53.05 Describe the role of tools such as UML (Unified Modeling Language) in ensuring the integrity of the application.
	53.06 Describe different types of UML diagrams and guidelines for their use.
	53.07 Develop a class based on its description in a UML diagram.
	53.08 Read an application specification and translate it into a working program.
	53.09 Describe the characteristics of different types of application development (e.g., Agile development).

	53.10 Compare and contrast different methodologies for application development (e.g., Scrum, XP, Crystal, FDD, and DSDM).
	53.11 Describe different methods for deploying applications.
54.0	Use nullable values in a .NET program. The student will be able to:
	54.01 Describe the use of nullable value types.
	54.02 Describe the use of the null value in .NET programs.
	54.03 Write statements to declare and initialize nullable value types.
	54.04 Write statements to determine if a nullable value type currently has a value.
55.0	Use the .NET String and StringBuilder classes in an application. The student will be able to:
	55.01 Compare and contrast the String and StringBuilder classes.
	55.02 Identify the performance implications of using the String and StringBuilder classes for different purposes.
	55.03 Use the methods of the String class to compare, search, format, split and join strings.
	55.04 Use the methods of the String and StringBuilder classes to find, replace, delete and insert substrings.
	55.05 Use the methods of the String class to translate a string into uppercase or lowercase.
	55.06 Use culture information to modify strings.
56.0	Use .NET classes to perform stream input/output. The student will be able to:
	56.01 Compare and contrast .NET classes used to perform file input/output (e.g., StreamReader, StreamWriter, StringReader, StringWriter, MemoryStream, BinaryReader, BinaryWriter).
	56.02 Compare and constrast .NET classes used to manipulate files and directories (e.g., Directory, DirectoryInfo, File, FileInfo, Path).
	56.03 Use .NET classes to search, add and delete directories.
	56.04 Use .NET classes to search, add and delete files.
	56.05 Use .NET classes to read and write text to a file.
	56.06 Use .NET classes to read and write objects of a variety of types to a file.
	56.07 Use .NET classes to read and write binary data to a file.
	56.08 Compare and contrast .NET classes used to compress data (e.g., GZipStream, DeflateStream).
	56.09 Use .NET classes to read and write compressed data to a file.
57.0	Use recursive functions to solve problems in .NET programs. The student will be able to:
	57.01 Describe the use of recursive methods in solving problems.
	57.02 Describe the difference of iterative and recursive methods.

	57.03 Demonstrate the use of direct recursion.
	57.04 Demonstrate the use of indirect recursion.
58.0	Write .NET programs that use interfaces. The student will be able to:
	58.01 Describe interfaces and their use in .NET programming.
	58.02 Declare and use a class that implements a standard interface.
	58.03 Compare and contrast inheritance from a base class and inheritance of an interface.
	58.04 Identify common interfaces and their purposes (e.g., IComparable, IComparer, IEquatable, IDisposable, IFormattable, IConvertible).
	58.05 Define and use a custom interface.
	58.06 Write classes that implement common interfaces (e.g., IComparable, IComparer, IEquatable, IDisposable, IFormattable, IConvertible).
	58.07 Describe the program to interface principle and its benefits.
59.0	Use .NET collections in applications. The student will be able to:
	59.01 Compare and contrast common non-generic collection classes, including ArrayList, BitArray, HashTable, Queue and Stack.
	59.02 Write programs that use common non-generic collection classes.
	59.03 Compare and contrast non-generic collection classes to generic collection classes.
	59.04 Compare and contrast common generic collection classes, including Dictionary, LinkedList, Queue, SortedDictionary, SortedList and Stack.
	59.05 Write programs that use common generic collection classes.
	59.06 Identify the collection class that is the best choice for different application requirements.
	59.07 Use iterators to access individual members of different types of collections.
	59.08 Use standard methods to add, delete, and modify members of different types of collections.
	59.09 Write statements to access members of a dictionary based on a key.
	59.10 Write statements to determine the existence of members of a dictionary based on a key or a value.
60.0	Demonstrate knowledge of different types of .NET applications. The student will be able to:
	60.01 Compare and contrast different types of .NET applications (e.g., Console, Windows Form, WPF, Windows Service, Class Library, web and database).
	60.02 Choose the best type of application to develop for a given application scenario.
	60.03 Describe the characteristics and capabilities of a console application.
	60.04 Develop, test, and debug a console application.

	60.05	Write a console application that uses command-line arguments.
61.0	Demonstrate knowledge of .NET architecture and tools. The student will be able to:	
	61.01	Describe components of the .NET architecture, including the Common Language Runtime (CLR), just-in-time (JIT) compiler, intermediate language (IL).
	61.02	Describe the steps required for a managed assembly to be built and run in the .NET environment.
	61.03	Compile single-file and multi-file assemblies using command-line tools.
	61.04	Describe common command-line tools used in developing .NET applications (e.g., Al.exe, Caspol.exe, Ildasm.exe, Makecert.exe, Sn,exe, Gacutil.ext) and their purposes.
	61.05	Use a signing tool to sign an assembly.
	61.06	Use a disassembly tool to view the classes, members, and methods of an assembly.
	61.07	Describe the garbage collection process.
62.0	Demonstrate knowledge of web applications. The student will be able to:	
	62.01	Describe the web as a platform for applications.
	62.02	Compare and contrast static and dynamic content.
	62.03	Describe how webpages are loaded to a computer from the Internet including the hardware, software, servers and protocols required.
	62.04	Compare and contrast server-side and client-side programming.
	62.05	Describe how a web browser downloads and renders a webpage.
	62.06	Describe options and methodology for website deployment.
	62.07	Compare and contrast different web development technologies, including HTML, CSS, JavaScript, CGI scripts, XML and ASP.NET.
	62.08	Describe common webpage terminology (e.g., page life cycle, the webpage event model, webpage state management, cookies, virtual directories).
	62.09	Define the steps in the page life cycle of an ASP.NET webpage.
	62.10	Describe state management as it related to maintenance of page information.
	62.11	Describe how web services are accessed from a client application.
	62.12	Describe the PostBack mechanism for posting data to a webpage using ASP.NET.
	62.13	Describe the role of Internet Information Services (IIS).
	62.14	Describe the role of Internet Service Providers (ISP) and the services they provide.
	62.15	Describe web services and related tools (e.g., Extensible Markup Language (XML), Simple Object Access Protocol (SOAP) and Web Service Definition Language (WSDL)).

	62.16	Describe the characteristics and purposes of Application objects and Session objects that are maintained by the ASP.NET run-time engine.
	62.17	Describe the common ASP.NET events for applications and sessions (i.e., application start, application end, application error, session start, session end).
	62.18	Describe entities that define standards for Internet applications (e.g., WS3, OASIS, WS-I).
63.0	Develop webpages using HTML, CSS, JavaScript and ASP.NET. The student will be able to:	
	63.01	Describe the characteristics and capabilities of a web application.
	63.02	Develop webpages using HTML (Hyper-text Markup Language) that include commonly used tags to define webpages with hyperlinks, tables, text, headings, images, backgrounds and frames.
	63.03	Develop webpages using CSS (cascading style sheets) to define a uniform appearance across multiple webpages.
	63.04	Develop webpages using JavaScript to define and implement interactive content.
	63.05	Define and use functions in JavaScript.
	63.06	Define and use local and global variables using JavaScript.
	63.07	Use conditional operators in JavaScript to selectively perform specific function.
	63.08	Use Boolean conditions in JavaScript to selectively perform with multiple conditions.
	63.09	Use JavaScript loops to perform iteration.
	63.10	Use string objects and escape sequences in a JavaScript.
	63.11	Use JavaScript to access, use, and modify HTML elements.
	63.12	Use JavaScript to handle common events, including mouse events, key events and page events.
	63.13	Use JavaScript to create and manage forms within a webpage.
	63.14	Develop webpages that use ASP.NET to provide interactivity.
	63.15	Describe standards for making webpages accessible to individuals with disabilities.
	63.16	Develop webpages that conform to accessibility standards.
64.0	Develop .NET Windows Form applications. The student will be able to:	
	64.01	Describe the characteristics and capabilities of a Windows Forms application.
	64.02	Compare and contrast common objects used in Windows Forms applications (e.g., Button, CheckBox, ColorDialog, ComboBox, DateTimePicker, GroupBox, Label, LinkLabel, ListBox, MenuStrip, Panel, PicureBox, RadioButton, ToolTip).
	64.03	Develop an interactive Windows Forms application that uses a variety of objects for input and output.
	64.04	Perform data validation on input fields.
	64.05	Describe the Windows Forms event model.

	64.06 Create Windows Forms application that respond to common events, including mouse events, keyboard events, load events, click events, resize events and drag events.
	64.07 Define Windows Forms applications with graphical user interfaces (GUI) that conform to appropriate usability guidelines.
	64.08 Create Windows Forms applications that use Multiple Document Interface (MDI) and Single Document Interface (SDI).
	64.09 Describe visual inheritance.
	64.10 Develop a Windows Forms application that inherits a form from a base application.
65.0	Develop Windows Service applications and class libraries. The student will be able to:
	65.01 Describe the characteristics and capabilities of a Windows Service application.
	65.02 Describe the states in the lifetime of a service.
	65.03 Describe the ServiceBase and ServiceController classes and their role in developing and controlling Windows Service applications.
	65.04 Develop a Windows Service application.
	65.05 Develop an installer for a Windows Service application.
	65.06 Install and deploy a Windows Service application.
	65.07 Test and debug a Windows Service application.
	65.08 Uninstall a Windows Service application.
	65.09 Develop, test, and debug a Class Library.
66.0	Demonstrate knowledge of database applications. The student will be able to:
	66.01 Explain common database terminology (e.g., relationships, normalization, fields, records, data integrity, referential integrity).
	66.02 Describe the benefits and characteristics of relational databases.
	66.03 Define primary keys and foreign keys and describe their purposes.
	66.04 Explain how database design fits into the database application development process.
	66.05 Translate an entity-relationship model into a relational database design.
	66.06 Differentiate between one-to-one, one-to-many, and many-to-many relationships.
	66.07 Move data from an unnormalized form through to a third normal form.
	66.08 Based on information requirements, define database tables that ensure data integrity and reduce redundant data.
	66.09 Describe routine maintenance for databases.
67.0	Demonstrate knowledge of structured query language (SQL) statements. The student will be able to:
	67.01 Describe the data manipulation language (DML) and describe various DML statements.

	67.02	List the capabilities of SQL SELECT statements.
	67.03	Write and execute a basic SELECT statement.
	67.04	Write and execute SELECT statements using the WHERE clause with common operators (i.e., =, <>, >, <, >=, <=, BETWEEN, LIKE, IN).
	67.05	Write and execute SELECT statements using the WHERE clause with logical operators, including AND and OR.
	67.06	Write and execute SELECT statements using the ORDER BY clause.
	67.07	Write and execute SELECT statements using wildcards.
	67.08	Write and execute UPDATE statements to modify rows in a table.
	67.09	Write and execute INSERT statements to insert rows into a table.
	67.10	Write and execute DELETE statements to delete rows in a table.
	67.11	Write and execute statements using JOIN to select data from two or more related tables.
	67.12	Write and execute statements that use SQL to perform common calculations (e.g., AVG, MAX, MIN, SUM).
68.0	Develop .NET database applications. The student will be able to:	
	68.01	Describe the purpose of ActiveX Data Objects (ADO).
	68.02	Describe the purpose of the ADO connection object.
	68.03	Write statements to connect to a database.
	68.04	Write statements to open a database.
	68.05	Write statements to create a recordset.
	68.06	Write statements to commit a transaction to a database.
	68.07	Write statements to rollback a transaction to a database.
	68.08	Write statements to close a connection to a database.
	68.09	Develop, test and debug a database application.
	68.10	Develop, test and debug a WPF application.
69.0	Successfully work as a member of a software development team. The student will be able to:	
	69.01	Accept responsibility for specific tasks in a given situation.
	69.02	Document progress and provide feedback on work accomplished in a timely manner.
	69.03	Complete assigned tasks in a timely and professional manner.
	69.04	Reassign responsibilities when the need arises.

	69.05 Complete daily tasks as assigned on one's own initiative.
70.0	Manage time according to a plan. The student will be able to:
	70.01 Set realistic time frames and schedules.
	70.02 Keep a written record of work accomplished on a daily basis.
	70.03 Meet goals and objectives set by the team.
	70.04 Identify individual priorities.
	70.05 Complete a weekly evaluation of accomplishments and reevaluate goals, objectives and priorities, as needed.
71.0	Keep acceptable records of progress problems and solutions. The student will be able to:
	71.01 Develop and use a record keeping system to record daily progress.
	71.02 Use a project journal to identify problem statement.
	71.03 Develop a portfolio of work accomplished to include requirements documents, design documents and UML, project and test plans and prototypes.
72.0	Plan, organize, and carry out a project plan. The student will be able to:
	72.01 Identify a substantive problem that can be addressed with a .NET software solution.
	72.02 Identify and document the potential customers for the project.
	72.03 Identify and document the customer requirements for the project including use case definitions.
	72.04 Document the proposed user interface for the project using common tools (e.g., mockups, event planning documents).
	72.05 Identify the hardware and software requirements for the project.
	72.06 Identify the programming tools required to develop the project.
	72.07 Write a detailed design document for the project.
	72.08 Write a detailed test plan for the project that addresses varying levels of testing including system testing and usability testing.
	72.09 Determine the scope of a project.
	72.10 Organize the team according to individual strengths.
	72.11 Assign specific tasks within a team.
	72.12 Determine project priorities.
	72.13 Identify required resources to complete the project.
	72.14 Plan, research, design, develop and evaluate activities, as required.
	72.15 Carry out the project plan to successful completion.

	72.16 Document design problems, test results, product defects and resolutions.
73.0	Manage resources. The student will be able to:
	73.01 Identify required resources for each stage of the project plan.
	73.02 Determine the methods needed to acquire needed resources.
	73.03 Demonstrate good judgment in the use of resources.
	73.04 Recycle and reuse resources where appropriate.
	73.05 Demonstrate an understanding of proper legal and ethical treatment of copyrighted material.
74.0	Use tools, materials, and processes in an appropriate and safe manner. The student will be able to:
	74.01 Identify the proper tool for a given job.
	74.02 Use tools and machines in a safe manner.
	74.03 Adhere to laboratory or job site safety rules and procedures.
	74.04 Identify the application of processes appropriate to the task at hand.
	74.05 Identify materials appropriate to their application.
75.0	Demonstrate an understanding of the software development process. The student will be able to:
	75.01 State the goals of the software application clearly.
	75.02 Identify and write a plan to achieve each goal.
	75.03 Develop a list of materials and content required for each goal.
	75.04 Develop a step-by-step procedure for developing the application.
	75.05 Follow a written procedure.
	75.06 Record data from evaluation activities.
	75.07 Document conclusions and solutions based on evaluation results, observations and data.
	75.08 Document progress using a project log.
	75.09 Write an abstract describing the project plan.
76.0	Research content related to the project and document the results following industry conventions. The student will be able to:
	76.01 Identify the basic research needed to develop the project plan.
	76.02 Identify available resources for completing background research required in the project plan.
	76.03 Demonstrate the ability to locate resource materials in a library, database, Internet and other research resources.

	76.04 Demonstrate the ability to organize information retrieval.
	76.05 Demonstrate the ability to prepare a topic outline.
	76.06 Write a draft of the research report.
	76.07 Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations and references.
	76.08 Prepare an electronically composed research paper in proper form.
	76.09 Conduct an alpha and beta evaluation of the project's product.
	76.10 Write a report on the evaluations, documenting results, data, observations and design changes based on the results.
77.0	Use presentation skills, and appropriate media to describe the progress, results and outcomes of the experience. The student will be able to:
	77.01 Prepare a multi-media presentation on the completed project.
	77.02 Make an oral presentation about the project using the multi-media materials.
	77.03 Review the presentation and make changes in the delivery method(s) to improve presentation skills.
78.0	Demonstrate competency in the area of expertise related to developing computer software using the .NET framework. The student will be able to:
	78.01 Demonstrate a mastery of the content of the selected subject area.
	78.02 Demonstrate the ability to use related technological tools, materials and processes related to the specific program area.
	78.03 Demonstrate the ability to apply the knowledge, experience and skill developed in the previous program completion to the successful completion of this demonstration.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: **Web Application Development & Programming**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y700500	
CIP Number	0511020102	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to the fundamentals of programming and software development; procedural and object-oriented programming; creating web-based applications, including testing, monitoring, debugging, documenting and maintaining applications.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points, with OCPs A, B, C, and D.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CTS0041	Computer Programmer Assistant	BUS ED 1 @2 COMP SCI 6 COMP PROG 7 G	300 hours
C	CTS0044	Computer Programmer		150 hours
D	CTS0034	Web Programmer		450 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
	01.01 Use reading skills.
	01.02 Use writing skills.
	01.03 Use mathematical strategies and procedures.
	01.04 Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
	02.01 Use critical thinking.
	02.02 Use creativity.
	02.03 Make sound decisions.
	02.04 Solve problems.
	02.05 Reason.
	02.06 Plan and organize.
03.0	Manage resources within an industry project
	03.01 Manage time.
	03.02 Manage money or resources.
	03.03 Manage materials.
	03.04 Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
	04.01 Manage systems.
	04.02 Monitor systems.
	04.03 Improve systems.
05.0	Use information for decision making.
	05.01 Locate information.
	05.02 Organize information.
	05.03 Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
	10.01 Identify online job posts relevant to his or her career aspirations.
	10.02 Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
	10.03 Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
	11.01 Develop a resume.
	11.02 Write a cover letter.
	11.03 Curate a professional portfolio that includes work products.
	11.04 Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
	12.01 Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
	12.02 Develop a plan to cultivate a professional digital footprint.
	12.03 Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, Internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop an awareness of the fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
17.0 Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development.
18.0 Demonstrate an understanding of the characteristics, use and selection of numerical, non-numerical and logical data types.
19.0 Distinguish between iterative and non-iterative program control structures.
20.0 Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted and translated programming languages.
21.0 Describe the processes, methods and conventions for software development and maintenance.
22.0 Explain the types, uses and limitations of testing for ensuring quality control.
23.0 Create a program design document using Unified Modeling Language (UML) or other common design tool.
24.0 Solve problems using critical thinking skills, creativity and innovation.
25.0 Use information technology tools.
26.0 Describe the importance of security and privacy information sharing, ownership, licensure and copyright.
27.0 Design a computer program to meet specific physical, operational and interaction criteria.
28.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
29.0 Create and document an interactive computer program that employs functions, subroutines or methods to receive, validate and process user input.
30.0 Effectively communicate and collaborate.

31.0 Demonstrate responsible use of technology and information.
32.0 Explain key concepts that distinguish object-oriented programming from procedural programming.
33.0 Create a project plan that defines requirements, structural design, time estimates and testing elements.
34.0 Design, document and create object-oriented computer programs.
35.0 Design a unit test plan for an object-oriented computer program, test and debug the program and report the results.
36.0 Understand human interactions in intelligence.
37.0 Demonstrate proficiency using HTML and XHTML to create web content.
38.0 Demonstrate proficiency using cascading style sheets (CSS) to format webpages.
39.0 Demonstrate proficiency using basic client-side scripting to control the content and the behavior of HTML and XHTML documents.
40.0 Demonstrate an understanding of JavaScript programming fundamentals.
41.0 Demonstrate proficiency in assigning and handling variables in JavaScript programs and functions.
42.0 Use event handlers in JavaScript programs and functions.
43.0 Recognize and assign data types appropriate to their use.
44.0 Demonstrate proficiency in using appropriate operators to achieve a planned output.
45.0 Write executable statements.
46.0 Demonstrate an understanding of variable scope.
47.0 Use good programming practices.
48.0 Demonstrate use of the Document Object Module (DOM).
49.0 Use conditional control statements in JavaScript.
50.0 Use iterative control statements in JavaScript.
51.0 Use nested loop iterative control statements in JavaScript.
52.0 Use JavaScript to produce input and output for programs.
53.0 Demonstrate proficiency in using Form Objects in JavaScript programs and functions.
54.0 Demonstrate proficiency in using methods in JavaScript programs and functions.
55.0 Demonstrate proficiency in using parameters in JavaScript programs and functions.
56.0 Utilize debugging techniques in programs.
57.0 Recognize security risks in programs.
58.0 Use plug-ins and libraries.
59.0 Demonstrate proficiency in programming for mobile delivery technology (e.g., iPhone/Android).
60.0 Demonstrate an understanding of Personal Home Page (PHP) programming language.
61.0 Demonstrate proficiency in PHP configuration.
62.0 Demonstrate an understanding of PHP language basics.
63.0 Demonstrate proficiency in the use of server processes.
64.0 Demonstrate an understanding of object-oriented programming in PHP.
65.0 Demonstrate proficiency in writing PHP code to handle file input/output (I/O) operations.
66.0 Demonstrate proficiency in creating, populating, and using arrays in PHP.
67.0 Demonstrate proficiency handling strings in PHP.
68.0 Demonstrate proficiency in using PHP to access databases via Open Database Connectivity (ODBC).
69.0 Demonstrate proficiency in applying best practices for ensuring creation of a secure program.
70.0 Demonstrate an understanding of key technologies, protocols, and architectures associated with web development and programming.

Florida Department of Education
Student Performance Standards

Program Title: Web Application Development & Programming
Career Certificate Program Number: Y700500

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)
Course Number: CTS0041 **Occupational Completion Point: B** **Computer Programmer Assistant – 300 Hours**
16.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas. The student will be able to:
16.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
16.02 Locate, organize and reference written information from various sources.
16.03 Construct writings and/or communications using developmentally appropriate terminology.
16.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
16.05 Analyze the positive and negative impacts of technology on popular culture and personal life.
16.06 Discuss how technology has changed the way people build and manage organizations and how technology impacts personal life.
16.07 Evaluate ways in which adaptive technologies may assist users with special needs.
16.08 Explain how societal and economic factors are affected by access to critical information.
16.09 Discuss the challenges (e.g., political, social and economic) in providing equal access and distribution of technology in a global society.
17.0 Explore the characteristics, tasks, work attributes, options and tools associated with a career in software development. The student will be able to:
17.01 Explore a variety of careers to which computing is central.
17.02 Compare and contrast appropriate and inappropriate social networking behaviors.
17.03 Discuss the impact of computing on business and commerce (e.g., automated inventory processing, financial transactions, e-commerce, virtualization, cloud computing).

	17.04 Evaluate the impacts of irresponsible use of information (e.g., plagiarism, falsification of data) on collaborative projects.
	17.05 Identify tasks performed by programmers.
	17.06 Describe how businesses use computer programming to solve business problems.
	17.07 Investigate job opportunities in the programming field.
	17.08 Explain different specializations and the related training in the computer programming field.
	17.09 Explain the need for continuing education and training of computer programmers.
	17.10 Understand and identify ways to use technology to support lifelong learning.
	17.11 Explain enterprise software systems and how they impact business.
	17.12 Describe ethical responsibilities of computer programmers.
	17.13 Describe the role of customer support to software program quality.
	17.14 Identify credentials and certifications that may improve employability for a computer programmer.
	17.15 Identify devices, tools, and other environments for which programmers may develop software.
18.0	Demonstrate an understanding of the characteristics, use and selection of numerical, non-numerical, and logical data types. The student will be able to:
	18.01 Identify the characteristics (e.g., size, limits) and uses of different numerical and non-numerical data types.
	18.02 Explain the types and uses of variables in programs.
	18.03 Determine the best data type to use for given programming problems.
	18.04 Compare and contrast simple data structures and their uses.
	18.05 Identify the types of operations that can be performed on different data types.
	18.06 Evaluate arithmetic and logical expressions using appropriate operator precedence.
	18.07 Explain how computers store different data types in memory.
	18.08 Demonstrate the difference between "data" and "information".
	18.09 Use different number systems to represent data.
	18.10 Explain how national and international standards (i.e., ASCII, UNICODE) are used to represent non-numerical data.
	18.11 Use Boolean logic to perform logical operations.
19.0	Distinguish between iterative and non-iterative program control structures. The student will be able to:
	19.01 Create non-iterative programming structures and explain their uses.
	19.02 Create iterative programming structures and explain their uses.

	19.03 Explain how sequence, selection, and iteration are building blocks of algorithms.
20.0	Differentiate among procedural, object-oriented, compiled, interpreted and translated programming languages. The student will be able to:
	20.01 Differentiate between multiple levels of an operating system, translation and interpretation that support program execution.
	20.02 Explain the program execution process (by an interpreter and in CPU hardware).
	20.03 Describe object-oriented concepts.
	20.04 Explain the characteristics of procedural and object-oriented programming languages.
	20.05 Compare and contrast programming languages that are compiled, interpreted and translated.
	20.06 Classify programming languages by paradigm and application domain (e.g., imperative, functional, logic languages and how well suited they are for certain application domains such as web programming, symbolic processing, data/numerical processing).
21.0	Describe the processes, methods and conventions for software development and maintenance. The student will be able to:
	21.01 Describe a software development process that is used to solve problems at different software development stages.
	21.02 Describe and demonstrate ethical and responsible use of modern communication media and devices.
	21.03 Define alternative methods of program development (e.g., rapid prototyping, waterfall, spiral model, peer coding).
	21.04 List and explain the steps in the program development cycle.
	21.05 Describe different types of documentation used in the program development cycle (e.g., requirements document, program design documents, test plans).
	21.06 Describe different methods used to facilitate version control.
22.0	Explain the types, uses, and limitations of testing for ensuring quality control. The student will be able to:
	22.01 Explain the uses and limits of testing in ensuring program quality.
	22.02 Explain testing performed at different stages of the program development cycle (e.g., unit testing, system testing, user acceptance testing).
	22.03 Describe and identify types of programming errors.
	22.04 Analyze and manipulate data collected by a variety of data collection techniques.
	22.05 Explain what tools are applied to provide automated testing environments.
23.0	Create a program design document using common design tool. The student will be able to:
	23.01 Describe different design methodologies and their uses (e.g., object-oriented design, structured design, rapid application development).
	23.02 Describe tools for developing a program design (e.g., Unified Modeling Language, flowcharts, design documents, pseudocode).
	23.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	23.04 Participate and contribute to a design review of a program design developed using a common program design tool (e.g., UML,

		flowcharts, design documents, pseudocode).
	23.05	Write a program design document using standard design methodology.
	23.06	Define input and output for a program module using standard design methodology.
24.0	Solve problems using critical thinking skills, creativity and innovation. The student will be able to:	
	24.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
	24.02	Employ critical thinking and interpersonal skills to resolve conflicts.
	24.03	Identify and document workplace performance goals and monitor progress toward those goals.
	24.04	Conduct technical research to gather information necessary for decision-making.
	24.05	Discuss digital tools or resources to use for a real-world task based on their efficiency and effectiveness, individually and collaboratively.
25.0	Use information technology tools. The student will be able to:	
	25.01	Use personal information management (PIM) applications to increase workplace efficiency.
	25.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email and internet applications.
	25.03	Employ computer applications to access, create, manage, integrate and store information.
	25.04	Employ collaborative/groupware applications to facilitate group work.
	25.05	Use a development process in creating a computational artifact, individually and collaboratively, followed by reflection, analysis and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data).
26.0	Describe the importance of security and privacy information sharing, ownership, licensure and copyright. The student will be able to:	
	26.01	Describe security and privacy issues that relate to computer networks including the permanency of data on the Internet, online identity, and privacy.
	26.02	Discuss the impact of government regulation on privacy and security.
	26.03	Describe how different types of software licenses (e.g., open source, proprietary licenses) can be used to share and protect intellectual property.
	26.04	Explain how access to information may not include the right to distribute the information.
	26.05	Describe differences between open source, freeware, and proprietary software licenses and how they apply to different types of software.
	26.06	Discuss security and privacy issues that relate to computer networks.
	26.07	Identify computer-related laws and analyze their impact on digital privacy, security, intellectual property, network access, contracts, and harassment.
27.0	Design a computer program to meet specific physical, operational and interaction criteria. The student will be able to:	

	27.01	Choose appropriate data types depending on the needs of the program.
	27.02	Define appropriate user prompts for clarity and usability (e.g., user guidance for data ranges, data types).
	27.03	Design and develop program for efficiency (e.g., less memory usage, less inputs/outputs, faster processing).
	27.04	Compare techniques for analyzing massive data collections.
	27.05	Identify the software environment required for a program to run (e.g., operating system required, mobile, web-based, desktop, delivery method).
	27.06	Create mobile computing applications and/or dynamic webpages through the use of a variety of design and development tools, programming languages and mobile devices/emulators.
	27.07	Explain the role of an application programming interface (API) in the development of applications and the distinction between a programming language's syntax and the API.
	27.08	Identify the tools required to develop a program (e.g., editors, compilers, linkers, integrated development environments, APIs, libraries).
	27.09	Use an industrial-strength integrated development environment to implement a program.
28.0	Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types. The student will be able to:	
	28.01	Use appropriate naming conventions to define program variables and methods.
	28.02	Use a program editor to write the source code for a program.
	28.03	Write programs that use selection structures.
	28.04	Write programs that use repetition structures.
	28.05	Write programs that use nested structures.
	28.06	Use internal documentation (e.g., single-line and multi-line comments, program headers, module descriptions, meaningful variable and function/module names) to document a program according to accepted standards.
	28.07	Compile, run, test and debug programs.
	28.08	Write programs that use standard arithmetic operators with different numerical data types.
	28.09	Write programs that use standard logic operators.
	28.10	Write programs that use a variety of common data types.
	28.11	Write programs that perform data conversion between standard data types.
	28.12	Write programs that define, use, search, and sort arrays.
	28.13	Write programs that use user-defined data types.
	28.14	Demonstrate understanding and use of appropriate variable scope.
	28.15	Explain recursive programming structure.

	28.16 Use global and local scope appropriately in program implementation.
29.0	Create and document an interactive computer program that employs functions, subroutines or methods to receive, validate and process user input. The student will be able to:
	29.01 Critically examine classical algorithms and implement an original algorithm.
	29.02 Write programs that perform user input and output.
	29.03 Write programs that validate user input (e.g., range checking, data formats, valid/invalid characters).
	29.04 Write program modules such as functions, subroutines, or methods.
	29.05 Write program modules that accept arguments.
	29.06 Write program modules that return values.
	29.07 Write program modules that validate arguments and return error codes.
	29.08 Design and implement a simple simulation algorithm to analyze, represent and understand natural phenomena.
	29.09 Use APIs and libraries to facilitate programming solutions.
	29.10 Participate in a peer code review to verify program functionality, programming styles, program usability and adherence to common programming standards.
30.0	Effectively communicate and collaborate. The student will be able to:
	30.01 Evaluate modes of communication and collaboration.
	30.02 Select appropriate tools within a project environment to communicate with project team members.
	30.03 Utilize project collaboration tools (such as version control systems and integrated development environments) while working on a collaborative software project.
	30.04 Generate, evaluate, and prioritize questions that can be researched through digital resources and online tool.
	30.05 Perform advanced searches to locate information and/or design a data-collection approach to gather original data.
	30.06 Communicate and publish key ideas and details to a variety of audiences using digital tools and media-rich resources.
31.0	Demonstrate responsible use of technology and information. The student will be able to:
	31.01 Explain the principles of cryptography by examining encryption, digital signatures, and authentication methods (e.g., explain why and how certificates are used with https for authentication and encryption).
	31.02 Implement an encryption, digital signature, or authentication method.
	31.03 Describe computer security vulnerabilities and methods of attack and evaluate their social and economic impact on computer systems and people.

Course Number: CTS0044 Occupational Completion Point: C Computer Programmer – 150 Hours	
32.0	Explain key concepts that distinguish object-oriented programming from procedural programming. The student will be able to:
32.01	Demonstrate the understanding and use of classes, objects, attributes and behaviors.
32.02	Demonstrate the understanding and use of inheritance.
32.03	Demonstrate the understanding and use of data encapsulation.
32.04	Demonstrate the understanding and use of polymorphism.
32.05	Use predefined functions and parameters, classes, and methods to divide a complex problem into simpler parts by using the principle of abstraction to manage complexity (e.g., by using searching and sorting as abstractions).
33.0	Create a project plan for an object-oriented programming project that defines requirements, structural design, time estimates and testing elements. The student will be able to:
33.01	Write a project plan for completion of a project that includes gathering program requirements, developing the program and testing it.
33.02	Write a program requirements document that identifies business purpose, functional requirements, system requirements and other common components of a requirements document.
33.03	Design an object-oriented program using standard design methodology.
33.04	Work with other team members to develop a project plan for a program.
33.05	Work with other team members to write a design document for a program with multiple functions and shared data.
33.06	Participate in design meetings that review program design documents for conformance to program requirements.
33.07	Estimate the time to develop a program or module.
33.08	Evaluate algorithms by their efficiency, correctness, and clarity (e.g., by analyzing and comparing execution times, testing with multiple inputs or data sets, and by debugging).
34.0	Design, document, and create object-oriented computer programs. The student will be able to:
34.01	Compare and contrast recursive functions to iterative methods.
34.02	Understand the implementation of character strings in the programming language.
34.03	Write programs that perform string processing (e.g., manipulating, comparing strings, concatenation).
34.04	Write programs that implements user-defined data types.
34.05	Decompose a problem by defining new functions and classes.
34.06	Write object-oriented programs that implement inheritance.
34.07	Write object-oriented programs that implement polymorphism.
34.08	Develop class constructors.

	34.09	Write programs that define and use program constants.
	34.10	Write programs that perform error handling.
	34.11	Participate in program code review meetings to evaluate program code for validity, quality, performance, data integrity and conformance to program design documents.
	34.12	Describe the concept of parallel processing as a strategy to solve large problems.
	34.13	Demonstrate concurrency by separating processes into threads of execution and dividing data into parallel streams.
	34.14	Update a program module to implement enhancements or corrections and demonstrate appropriate documentation (internal and external) related to version control.
	34.15	Write programs that use complex data structures (e.g., stacks, queues, trees, linked list).
	34.16	Write programs that are event-driven.
	34.17	Write programs that perform file input and output (i.e., sequential and random access file input/output).
	34.18	Explain intractable problems and understand that problems exists that are computationally unsolvable (undecidable) (e.g., classic intractable problems include Towers of Hanoi, TSP).
	34.19	Explain the value of heuristic algorithms to approximate solutions for intractable problems (e.g., a heuristic solution to TSP).
35.0	Design a unit test plan for an object-oriented computer program, test and debug the program, and report the results. The student will be able to:	
	35.01	Develop a test plan for an object-oriented program.
	35.02	Write test plans for event-driven programs.
	35.03	Write test plans for programs that perform file input and output.
	35.04	Perform test and debug activities on object-oriented programs, including those written by someone else.
	35.05	Perform test and debug activities on an event-driven program.
	35.06	Perform test and debug activities on programs that perform file input and output and verify the correctness of output files.
	35.07	Document the findings of testing in a test report.
36.0	Understand human interactions in intelligence. The student will be able to:	
	36.01	Describe the unique features of computers embedded in mobile devices and vehicles.
	36.02	Describe the common physical and cognitive challenges faced by users when learning to use software and hardware.
	36.03	Describe the process of designing software to support specialized forms of human-computer interaction.
	36.04	Explain the notion of intelligent behavior through computer modeling and robotics.
	36.05	Describe common measurements of machine intelligence (e.g., Turing test).
	36.06	Describe a few of the major branches of artificial intelligence (e.g., expert systems, natural language processing, machine perception,

		machine learning).
	36.07	Describe major applications of artificial intelligence and robotics, including, but not limited to, the medical, space and automotive fields.
Course Number: CTS0034 Occupational Completion Point: D Web Programmer – 450 Hours		
37.0		Demonstrate proficiency using HTML and XHTML to create web content. The student will be able to:
	37.01	Use storyboarding techniques for designing a website (e.g., linear, hierarchical).
	37.02	Identify elements of a webpage.
	37.03	Create webpages using HTML and XHTML tags that create basic elements (e.g., links, lists, formatted text, tables).
	37.04	Create webpages that utilize tables to achieve complex layout.
	37.05	Add graphic content to webpages.
	37.06	Create webpages that utilize client-side image maps.
	37.07	Develop, integrate, and apply the use of forms in website design.
	37.08	Optimize web content for desirable search engine placement.
	37.09	Demonstrate an understanding of browser compatibility issues by designing pages that comply with the current web Content Accessibility Guidelines issued by the World Wide Web Consortium (W3C).
	37.10	Demonstrate an understanding of web accessibility issues by developing pages that meet Bobby accessibility checker criteria.
	37.11	Explain basic XML syntax and how XHTML conforms to the XML standard.
	37.12	Use a WYSIWYG editor to develop and manage a website.
	37.13	Use markup validation tools to test HTML and XHTML documents for well-formed elements and make all corrections necessary to ensure compliance with W3C standards.
	37.14	Analyze and modify HTML and XHTML source code developed by others.
38.0		Demonstrate proficiency using cascading style sheets (CSS) to format webpages. The student will be able to:
	38.01	Explain the advantages and disadvantages of using Cascading Style Sheets (CSS) to format webpages.
	38.02	Describe the difference between linked, embedded, imported and inline styles and explain how styles are inherited.
	38.03	Explain the difference between classes, id, and span elements.
	38.04	Utilize CSS properties within webpages to control page layout, fonts, colors, backgrounds and other presentation effects.
	38.05	Demonstrate understanding of the Box Model.

	38.06 Demonstrate proficiency in creating 1 to 3 column layouts.
	38.07 Create navigation system through CSS.
39.0	Demonstrate proficiency using basic client-side scripting to control the content and the behavior of HTML and XHTML documents. The student will be able to:
	39.01 Describe the difference between server-side and client-side processing.
	39.02 Describe the term “scripting language” and explain how scripting languages differ from compiled languages.
	39.03 Create webpages that employ client-side scripting to control content and display.
40.0	Demonstrate an understanding of JavaScript programming fundamentals. The student will be able to:
	40.01 Describe server side versus client side applications including interpreters.
	40.02 Describe the purpose and use of an interpreter in relation to JavaScript.
	40.03 Describe differences in different types of JavaScript implementations (i.e., Jscript, ECMA).
	40.04 Declare and initialize variables.
	40.05 Assign new values to variables.
	40.06 Create and use constant variables.
	40.07 Describe the difference of programming languages versus scripting languages.
	40.08 Describe object-based nature and platform independence.
	40.09 Describe and demonstrate inline scripting.
41.0	Demonstrate proficiency in assigning and handling variables in JavaScript programs and functions. The student will be able to:
	41.01 Describe how variables are used in programs.
	41.02 Identify which data type should be used for a given value.
	41.03 Identify the syntax for using variables.
	41.04 Declare and initialize variables.
	41.05 Assign new values to variables.
	41.06 Create and use constant variables.
	41.07 Describe and demonstrate the use of properties.
	41.08 Describe identifiers and identify valid and invalid identifiers.
	41.09 Describe and identify reserved words, delimiters, literals and comments.
42.0	Use event handlers in JavaScript programs and functions. The student will be able to:

	42.01 Describe the event model and five events (form, image, map, link and window).
	42.02 Demonstrate and use the window events load, focus, blur and unload.
	42.03 Demonstrate and use the form events change, reset and submit.
	42.04 Demonstrate and use the text events cut, paste, select and copy.
	42.05 Demonstrate and use the mouse events mousemove, mousedown, click, mousewheel, mouseover, mouseout and mouseup.
	42.06 Demonstrate and use the keyboard events keyup, keydown, keypress.
	42.07 Demonstrate using the appropriate event handlers with their associated events.
43.0	Recognize and assign data types appropriate to their use. The student will be able to:
	43.01 Describe the data type categories.
	43.02 Give examples of var, primitives, null and undefined data types.
	43.03 Demonstrate the use of var in relation to other datatypes.
44.0	Demonstrate proficiency in using appropriate operators to achieve a planned output. The student will be able to:
	44.01 Construct statements using arithmetic operators.
	44.02 Construct statements using relational operators.
	44.03 Construct and use statements using logical operators.
	44.04 Construct and use statements using string concatenation, and strict comparison.
	44.05 Construct and use statements using assignment operators.
	44.06 Construct and execute statements using operator precedence.
45.0	Write executable statements. The student will be able to:
	45.01 Construct variable assignment statements.
	45.02 Construct statements using built-in functions.
	45.03 Describe when implicit data type conversions take place.
	45.04 List the drawbacks of implicit data type conversions.
	45.05 Construct statements using functions to explicitly convert data types.
46.0	Demonstrate an understanding of variable scope. The student will be able to:
	46.01 Understand the scope and visibility of variables.
	46.02 Write programs using local variables.

	46.03 Describe the scope of a variable.
47.0	Use good programming practices. The student will be able to:
	47.01 List examples of good programming practices.
	47.02 Insert comments into code.
	47.03 Demonstrate the use of <no script> tag.
	47.04 Follow formatting guidelines when writing code.
	47.05 Understand the different types of errors produced by programs.
48.0	Demonstrate use of the Document Object Module (DOM). The student will be able to:
	48.01 Create and use user defined objects.
	48.02 Create user defined objects with properties and methods.
	48.03 Describe and Use the Array Object including its parameters, properties and methods (chop, join, pop, push, splice, split).
	48.04 Describe and Use the Date Object including its multiple constructors, properties and methods (getDay, getMonth, getYear, getMinutes, getHous, getTime).
	48.05 Describe and use the Window Object including \properties and methods.
	48.06 Describe and use the Image Object including its properties and methods.
	48.07 Describe and use the History Object including its properties and methods.
	48.08 Describe and use the RegEx Object for basic and complex regular expressions.
	48.09 Describe and use the String Object including its properties and methods.
	48.10 Describe and use the Math Object including its properties and methods.
49.0	Use conditional control statements in JavaScript. The student will be able to:
	49.01 Construct and use an if statement.
	49.02 Construct and use a switch statement.
	49.03 Construct and use a while, do while and for loop.
	49.04 Construct and use a conditional operator.
50.0	Use iterative control statements in JavaScript. The student will be able to:
	50.01 Describe the types of loop statements and their uses.
	50.02 Construct and use the while and do while loop.
	50.03 Construct and use the for loop.

	50.04 Describe when a while loop is used.
	50.05 Describe when a for loop is used.
51.0	Use nested loop iterative control statements in JavaScript. The student will be able to:
	51.01 Construct and execute a program using nested loops.
	51.02 Construct and execute a loop using break and continue.
	51.03 Evaluate a nested loop construct and sentinel value.
52.0	Use JavaScript to produce input and output for programs. The student will be able to:
	52.01 Describe and use the prompt() and confirm() to input data into programs.
	52.02 Describe and demonstrate the use of the alert() to produce output to the console.
	52.03 Describe and demonstrate how to input data using JavaScript Events.
	52.04 Describe and demonstrate how to output using the document.write().
	52.05 Explain the difference of prompt() and confirm() functions.
	52.06 Create and use escape sequences.
53.0	Demonstrate proficiency in using Form Objects in JavaScript programs and functions. The student will be able to:
	53.01 Use Form objects to validate input.
	53.02 Access the value of the form object through its associated method.
	53.03 Describe and use button, checkbox, textarea, select, radio, hidden and text objects.
	53.04 Access and modify values and attributes at runtime using getElementbyId, getElementsbyName, getElementsbyTagName and inner HTML.
54.0	Demonstrate proficiency in using methods in JavaScript programs and functions. The student will be able to:
	54.01 Differentiate between anonymous methods and methods.
	54.02 Identify the benefits of using methods.
	54.03 Describe and use inner method.
	54.04 Create a method.
	54.05 Describe how a method is invoked.
55.0	Demonstrate proficiency in using parameters in JavaScript programs and functions. The student will be able to:
	55.01 Describe how parameters are passed into functions.
	55.02 Define a parameter.

	55.03 Create a method using a parameter.
	55.04 Invoke a method that has parameters.
	55.05 Distinguish between formal and actual parameters.
56.0	Utilize debugging techniques in programs. The student will be able to:
	56.01 Use the display property to enable/disable code blocks.
	56.02 Use document.write() to log program execution.
	56.03 Test program in different browsers and mobile devices for compatibility errors.
	56.04 Use comments as a flow control while debugging.
57.0	Recognize security risks in programs. The student will be able to:
	57.01 Describe the security risk of cookies and browsers.
	57.02 Identify security responsibilities of browsers and operating system.
	57.03 Describe security systems such as frame to frame URL changing.
	57.04 Describe the use of signed scripts.
	57.05 Create and use cookies in a secure manner.
58.0	Use plug-ins and libraries. The student will be able to:
	58.01 Use external libraries in the program.
	58.02 Describe and contrast the following industry libraries JQuerry, Dojo, LightBox and Moo Tools, PhoneGap.
	58.03 Describe different types of libraries full, effects, tools, graphing, math, cryptography and AJAX.
	58.04 Identify how load and reference external and user made scripts.
	58.05 Describe AJAX elements and procedures.
	58.06 Describe XML.
	58.07 Demonstrate the use of XMLHttpRequest to retrieve data.
59.0	Demonstrate proficiency in programming for mobile delivery technology (e.g., iPhone/Android). The student will be able to:
	59.01 Respond to multi-touch and gesture events.
	59.02 Describe and demonstrate the use of webkit CSS.
	59.03 Use the meta tag to enable native look and feel.
	59.04 Create a splash screen.

	59.05 Describe and demonstrate app caching.
	59.06 Describe and demonstrate use of JQuery for mobile development.
	59.07 Describe how to publish the app using XCode.
60.0	Demonstrate an understanding of Personal Home Page (PHP) programming language. The student will be able to:
	60.01 Describe the evolution of PHP as a programming language.
	60.02 Discuss the strengths and limitations of PHP.
61.0	Demonstrate proficiency in PHP configuration. The student will be able to:
	61.01 Set up a PHP host (wamp, mamp, online).
	61.02 Configure PHP for File Transfer Protocol (FTP) access.
	61.03 Configure the config.php file.
62.0	Demonstrate an understanding of PHP language basics. The student will be able to:
	62.01 Describe how variables are declared, referenced, and passed.
	62.02 Describe the control structures inherent with PHP programming.
	62.03 Describe the three types of arrays used in PHP.
	62.04 Describe how functions in PHP are created, called and controlled.
63.0	Demonstrate proficiency in the use of server processes. The student will be able to:
	63.01 Describe a session and explain its importance and use in web programming.
	63.02 Describe the server processes associated with forms handling.
	63.03 Compare and contrast the use of GET and POST.
	63.04 Describe cookies and explain their use, population, control and risks.
	63.05 Describe HTTP Headers and their role in web development.
	63.06 Describe HTTP Authentication.
64.0	Demonstrate an understanding of object-oriented programming in PHP. The student will be able to:
	64.01 Create classes using PHP.
	64.02 Describe inheritance and its role in PHP programming.
	64.03 Write PHP code to handle exceptions.
	64.04 Write PHP code to accommodate different interfaces.

65.0	Demonstrate proficiency in writing PHP code to handle file input/output (I/O) operations. The student will be able to:
	65.01 Write PHP code to perform open, read, and write operations on files.
	65.02 Write PHP code to initiate file system functions.
	65.03 Write PHP code to handle streams.
66.0	Demonstrate proficiency in creating, populating, and using arrays in PHP. The student will be able to:
	66.01 Create, populate and write code to extract information from a numeric array in PHP.
	66.02 Create, populate and write code to extract information from an associative array in PHP.
	66.03 Create, populate and write code to extract information from a multidimensional array in PHP.
67.0	Demonstrate proficiency handling strings in PHP. The student will be able to:
	67.01 Write PHP code to retrieve or extract one or more characters from a string.
	67.02 Write PHP code to convert a string from data type to another.
	67.03 Write PHP code to manipulate the display characteristics of string data.
	67.04 Write PHP code that uses string date to control program flow.
	67.05 Write PHP code to join array elements with a string.
68.0	Demonstrate proficiency in using PHP to access databases via Open Database Connectivity (ODBC). The student will be able to:
	68.01 Write PHP code to create an ODBC connection and retrieve information from a database using the appropriate Structured Query Language (SQL) statement.
	68.02 Describe a prepared statement and discuss its primary advantages (e.g., code efficiency, SQL Injection prevention).
	68.03 Create a prepared statement to perform specific SQL actions.
	68.04 Describe a PHP Data Object (PDO) transaction and explain its primary advantages.
	68.05 Create a prepared statement and associated result set using PDOStatement.
69.0	Demonstrate proficiency in applying best practices for ensuring creation of a secure program. The student will be able to:
	69.01 Describe an SQL Injection, its consequences and ways in which it may be prevented via programming.
	69.02 Describe the Remote Code Injection vulnerability in PHP and ways in which it may be prevented.
	69.03 Describe the risk of session hijacking in PHP and ways to program around it.
	69.04 Describe the risks associated with uploading files in PHP and ways in which risks might be mitigated.
	69.05 Describe Secure Sockets Layer (SSL) and usage issues related to PHP.
70.0	Demonstrate an understanding of key technologies, protocols, and architectures associated with web development and programming. The student will be able to:

70.01	Describe SimpleXML functions.
70.02	Describe Extensible Markup Language (XML) Extension.
70.03	Describe XML Path Language (Xpath).
70.04	Describe Web Services.
70.05	Describe Simple Object Access Protocol (SOAP).
70.06	Describe Representational State Transfer (REST).
70.07	Describe JavaScript Object Notation (JSON).
70.08	Asynchronous JavaScript and XML (AJAX).

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Florida Department of Education
Curriculum Framework

Program Title: Applied Artificial Intelligence Specialist
Program Type: Career Preparatory
Career Cluster: Information Technology

Career Certificate Program		
Program Number	Y700600	
CIP Number	0511010202	
Grade Level	30, 31	
Program Length	600 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 11	Communications (Reading and Language Arts): 11

Purpose

The content includes but is not limited to foundational and applied Artificial Intelligence concepts; generative Artificial Intelligence tools and applications; prompt engineering and AI interaction techniques; automation and intelligent workflow development; AI data concepts and lifecycle management; cloud-based AI services; cybersecurity and responsible AI practices; AI agent creation and operational support; business and organizational AI integration; and human-AI collaboration strategies. Instruction also includes exploration of Artificial Intelligence career pathways; development of professional communication, collaboration, and critical thinking skills; ethical and responsible technology use; digital productivity and business applications; workplace readiness skills including leadership, adaptability, and project management; and applied learning experiences designed to prepare students for success in postsecondary education, industry certification attainment, and employment within AI-enabled and technology-driven industries.

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare students for further education and careers in the Information Technology career cluster with an emphasis on Artificial Intelligence (AI) technologies and AI-enabled workplace environments. The program provides technical skill proficiency and includes competency-based applied learning experiences that contribute to academic knowledge, higher-order reasoning, ethical decision-making and problem-solving skills while promoting positive work attitudes, general employability skills, technical competencies and occupation-specific knowledge related to Artificial Intelligence systems and emerging intelligent technologies.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points. To complete this program, students must complete OCP A-C.

This program consists of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section (s.) 1007.24(1), Florida Statutes (F.S). Career and Technical credit shall be awarded to the student on a transcript in accordance with s.1001.44(3)(b), F.S.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	CAI0870	Applied Artificial Intelligence Technician	BUS ED 1 @2 COMPU SCI 6 INFO TECH 7G	300 hours
C	CAI0601	Artificial Intelligence Operations and Business Integration Professional		150 hours

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project.
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Demonstrate an understanding of networks.
03.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
04.0 Use presentation applications to enhance communication skills.
05.0 Use spreadsheet applications to enhance communication skills.
06.0 Use database applications to store and organize data.
07.0 Use electronic mail to enhance communication skills.
08.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
09.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
10.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
11.0 Develop awareness of computer languages, web-based & software applications, and emerging technologies.
12.0 Demonstrate comprehension and communication skills.
13.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
14.0 Develop awareness of fundamentals of cybersecurity.
15.0 Investigate emerging technologies and their impact on the world.
16.0 Demonstrate foundational Artificial Intelligence concepts and workplace applications.
17.0 Demonstrate Artificial Intelligence productivity and digital workplace integration skills.
18.0 Demonstrate Artificial Intelligence prompting and interaction techniques.
19.0 Demonstrate Artificial Intelligence data concepts and lifecycle management.
20.0 Apply Artificial Intelligence automation and workflow solutions.
21.0 Demonstrate Artificial Intelligence networking, cloud and system integration concepts.
22.0 Demonstrate Artificial Intelligence cybersecurity and governance practices.
23.0 Apply Artificial Intelligence in business and organizational environments.
24.0 Demonstrate professional, communication, and employability skills in Artificial Intelligence environments.
25.0 Demonstrate advanced Generative Artificial Intelligence workplace integration skills.
26.0 Demonstrate Artificial Intelligence operations, monitoring and support skills.
27.0 Demonstrate Artificial Intelligence agent design and development concepts.
28.0 Demonstrate Artificial Intelligence agent learning and adaptation principles.
29.0 Demonstrate leadership, governance and responsible Artificial Intelligence deployment.

Florida Department of Education
Student Performance Standards

Program Title: Applied Artificial Intelligence Specialist
Career Certificate Program Number: Y700600

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)

Course Number: CAI0870 **Occupational Completion Point: B** **Applied Artificial Intelligence Technician – 300 Hours**	
16.0	Demonstrate foundational Artificial Intelligence concepts and workplace applications. The student will be able to:
16.01	Define Artificial Intelligence, Machine Learning, Generative AI and automation technologies.
16.02	Explain the key concepts of meeting client needs.
16.03	Apply the principles of Human Computer Interface (HCI) to design and develop an effective look and feel for a website.
16.04	Design and create a webpage for optimal display in multiple browsers.
17.0	Demonstrate Artificial Intelligence productivity and digital workplace integration skills. The student will be able to:
17.01	Utilize AI tools to improve workplace productivity and efficiency.
17.02	Integrate AI assistants into document creation, communication and scheduling tasks.
17.03	Apply AI tools for research, summarization and decision support.
17.04	Evaluate AI-generated outputs for accuracy and reliability.
17.05	Demonstrate responsible workplace use of AI productivity platforms.
18.0	Demonstrate Artificial Intelligence prompting and interaction techniques. The student will be able to:
18.01	Construct effective prompts using clear objectives and constraints.
18.02	Apply iterative prompting techniques to refine AI responses.
18.03	Utilize role-based and contextual prompting strategies.
18.04	Analyze prompt effectiveness based on output quality.

	18.05 Demonstrate safe and ethical interaction with AI systems.
19.0	Demonstrate Artificial Intelligence data concepts and lifecycle management. The student will be able to:
	19.01 Describe data collection, preparation and preprocessing methods.
	19.02 Explain structured and unstructured data types used in AI systems.
	19.03 Demonstrate data labeling and validation concepts.
	19.04 Identify stages of the AI data lifecycle.
	19.05 Apply data privacy and governance principles.
20.0	Apply Artificial Intelligence automation and workflow solutions. The student will be able to:
	20.01 Identify processes suitable for AI automation.
	20.02 Design automated workflows using AI-enabled tools.
	20.03 Implement task automation using AI integrations.
	20.04 Evaluate workflow efficiency improvements using automation metrics.
	20.05 Troubleshoot automated AI workflows.
21.0	Demonstrate Artificial Intelligence networking, cloud and system integration concepts. The student will be able to:
	21.01 Describe cloud computing environments supporting AI systems.
	21.02 Identify APIs and services used for AI integration.
	21.03 Explain AI deployment using cloud platforms.
	21.04 Demonstrate integration between AI applications and enterprise systems.
	21.05 Describe edge computing and IoT AI applications.
22.0	Demonstrate Artificial Intelligence cybersecurity and governance practices. The student will be able to:
	22.01 Identify cybersecurity risks associated with AI systems.
	22.02 Apply secure data handling practices in AI environments.
	22.03 Explain AI governance and compliance requirements.
	22.04 Recognize threats such as model poisoning and data leakage.
	22.05 Demonstrate responsible AI usage aligned with organizational policy.
23.0	Apply Artificial Intelligence in business and organizational environments. The student will be able to:
	23.01 Analyze business processes enhanced through AI adoption.

	23.02 Apply AI tools for marketing, finance, operations or customer service.
	23.03 Evaluate organizational benefits and risks of AI implementation.
	23.04 Develop AI-supported decision-making solutions.
	23.05 Demonstrate AI-driven problem-solving in workplace scenarios.
24.0	Demonstrate professional, communication, and employability skills in Artificial Intelligence environments. The student will be able to:
	24.01 Demonstrate teamwork in AI-supported projects.
	24.02 Communicate technical AI concepts to non-technical audiences.
	24.03 Apply professional ethics in AI usage.
	24.04 Demonstrate digital citizenship and workplace professionalism.
	24.05 Develop career readiness skills related to AI occupations.

Course Number: CAI0601 **Occupational Completion Point: C** **Artificial Intelligence Operations and Business Integration Professional – 150 Hours**	
25.0	Demonstrate advanced Generative Artificial Intelligence workplace integration skills. The student will be able to:
	25.01 Generate multimedia content using generative AI tools.
	25.02 Evaluate risks of hallucinations and misinformation in generative AI.
	25.03 Apply AI tools for coding, design, and content creation tasks.
	25.04 Customize generative AI outputs for organizational needs.
	25.05 Compare multiple generative AI platforms and capabilities.
26.0	Demonstrate Artificial Intelligence operations, monitoring and support skills. The student will be able to:
	26.01 Monitor AI system performance and outputs.
	26.02 Identify operational issues in deployed AI solutions.
	26.03 Apply troubleshooting techniques for AI tools and services.
	26.04 Maintain documentation for AI operations and updates.
	26.05 Support users interacting with AI-enabled systems.
27.0	Demonstrate Artificial Intelligence agent design and development concepts. The student will be able to:
	27.01 Define AI agents and autonomous system functions.

	27.02 Identify components of intelligent agents.
	27.03 Design basic task-oriented AI agents.
	27.04 Explain decision-making logic within agents.
	27.05 Demonstrate agent interaction with external tools or APIs.
28.0	Demonstrate Artificial Intelligence agent learning and adaptation principles. The student will be able to:
	28.01 Explain supervised, unsupervised and reinforcement learning concepts.
	28.02 Describe how agents improve through feedback loops.
	28.03 Analyze adaptive system behavior over time.
	28.04 Evaluate training outcomes and performance adjustments.
	28.05 Identify risks associated with autonomous learning systems.
29.0	Demonstrate leadership, governance and responsible Artificial Intelligence deployment. The student will be able to:
	29.01 Explain responsible AI principles including fairness and transparency.
	29.02 Evaluate ethical impacts of AI deployment decisions.
	29.03 Develop organizational AI usage guidelines.
	29.04 Demonstrate leadership in AI adoption initiatives.
	29.05 Assess societal and workforce impacts of AI technologies.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in s.1004.02, F.S., may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040, F.A.C.). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in s. 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as

instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: Postsecondary curriculum and regulated secondary programs cannot be modified.