Florida Department of Education
Curriculum Framework

Program Title: **Data Science Technology**
Career Cluster: **Information Technology**

AS	
CIP Number	1511010100
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Business Professionals of America (BPA)
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Others

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, 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.

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, 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.

Florida Department of Education
Student Performance Standards

Program Title: **Data Science Technology**
CIP Number: **1511010100**
Program Length: **60 credit hours**
SOC Code(s): **15-1199**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. 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:
01.01.1 Describe data sources and methods for acquiring data.
01.01.2 Describe how data is captured (i.e: from control systems devices or Internet of things devices, etc.).
01.01.3 Describe how acquired data is cleansed and enriched.
01.02 Describe techniques for analyzing data:
01.02.1 Describe data models.
01.02.2 Describe techniques used for data visualization.
01.02.3 Describe statistical methods which are applied to data to extract useful information.
01.03 Describe how data analysis results can be reported.
01.03.1 Describe dashboards and how they can be used to make business decisions.
01.03.2 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:
03.02.1	Structured and unstructured data.
03.02.2	RDBMS (Relational Database Management Systems).
03.02.3	Data warehouses and OLAP (Online Analytical Processing) Cubes.
03.02.4	Spreadsheets.
03.02.5	XML (eXtensible Markup Language) data.
03.02.6	CSV (Comma Separated Values) data.
03.02.7	Web data.
03.02.8	GIS (Geographical Information Systems) data.
03.02.9	Raw data.
03.03	Describe and utilize data preprocessing and normalization:
03.03.1	Describe and apply common techniques for cleaning textual, numeric, and categorical data.
03.03.2	Describe the use of probabilistic methods and decision trees for classification.
03.03.3	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:
03.06.1	Design an OLAP database using dimensional modeling techniques.

	03.06.2	Create a data warehouse based on OLAP design.
	03.06.3	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:	
	04.03.1	Calculate summary statistics.
	04.03.2	Calculate correlation values.
	04.03.3	Construct confidence intervals from sample data.
	04.03.4	Construct confidence intervals from sample data.
	04.03.5	Conduct tests of hypotheses with one and two samples.
	04.03.6	Use correlation and linear regression methods to analyze data.
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	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.	
04.06	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	Demonstrate understanding of basic security principles including 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.	

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)

Business Professionals of America (BPA) is an intercurricular career and technical student organization 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.

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:

No certificates included.

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**

AS	
CIP Number	1511010307
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1121 – Computer Systems Analysts

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 degree program(s) consists of 60 credit hours.

Standards

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

01.0 Demonstrate how to use current productivity software applications and tools including word processing, spreadsheets, database, presentation software, email, and internet browser applications.
02.0 Install, configure, upgrade and troubleshoot computer hardware.
03.0 Install, configure and troubleshoot 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 systems.
06.0 Create and maintain a database.
07.0 Demonstrate knowledge of networking technologies.
08.0 Install, configure, manage, deploy, monitor and troubleshoot a networked server environment.
09.0 Foundations of Project Management.
10.0 Perform customer service skills.

In addition, students will complete the competencies in one of the following specializations:

Information Technology Support Specialization Standards

11.0 Demonstrate proficiency in supporting Windows-based client and network computer systems.
12.0 Demonstrate proficiency in installing, configuring, deploying, and supporting desktop applications.
13.0 Perform help desk support activities.
14.0 Demonstrate proficiency in supporting Windows users.

Information Technology Analysis Specialization Standards

11.0 Perform systems monitoring activities.
12.0 Perform computer information systems analysis activities.

Mobile Device Technology Analysis Specialization Standards

11.0 Configure, manage and troubleshoot Windows client mobile features including configuring mobile devices, power management, disk encryption, wireless networking, VPN and remote access.
12.0 Configure, enable, manage and troubleshoot VPN, mobile and remote access.

Geographic Information System

11.0 Perform general computer application activities.
12.0 Demonstrate an understanding of geographic coordinate systems.
13.0 Perform map creation activities.
14.0 Perform GIS data file creation activities.

15.0 Perform GIS data file manipulation activities.
16.0 Perform GIS analysis activities.
17.0 Perform database operations.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Information Technology**
CIP Number: **1511010305**
Program Length: **60 credit hours**
SOC Code(s): **11-3021**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate how to use current productivity software applications and tools including word processing, spreadsheets, database, presentation software, email, and internet browser applications. – The student will be able to:
01.01	Distinguish between appropriate and inappropriate use of technology in a professional or academic setting.
01.02	Distinguish between legal and illegal file-sharing practices.
01.03	Identify the ways in which a virus can infect electronic devices.
01.04	Describe common threats to the security of electronic devices.
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 hardware implications.
02.03	Identify various coding schemes including ASCII and other data types.
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	Construct and configure a computer system from individual components.
02.10	Install, configure, optimize, and upgrade components in portable devices.
02.11	Perform file and system management tasks.

	02.12	Perform the installation, configuration, optimization, maintenance, and upgrading of printers and other peripheral devices.
	02.13	Troubleshoot new and existing computers and peripheral devices, and document the problems discovered and the solutions implemented.
	02.14	Troubleshoot client-side network connectivity issues using appropriate tools.
	02.15	Identify potential hazards and implement proper safety procedures, including electrostatic discharge (ESD) precautions and professional operational procedures, safe work environment and equipment handling.
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	Identify, install, configure, and troubleshoot device drivers.
	03.04	Verify digital signatures of device drivers.
	03.05	Configure 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 to block dangerous 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	Install, configure and monitor updates, and perform system audits.
	03.11	Install, configure, upgrade, monitor and optimize security measures and policies.
	03.12	Perform preventive maintenance and activity monitoring for computer and network security.
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	Describe the origin, structure, and history of the Internet and the World Wide Web.
	04.02	Describe Internet organizations, such as the Internic, IETF, domains and Requests for Comments (RFCs).
	04.03	Define and compare web-based marketing techniques.
	04.04	Describe e-commerce.
	04.05	Differentiate among an intranet site, an extranet site, and an Internet site.

04.06	Characterize the role of the Internet in today's society.
04.07	Describe several major ethical issues related to Internet use.
04.08	Identify legal issues related to Internet use.
04.09	Identify how the Internet affects intellectual property rights.
04.10	Identify how the Internet affects personal security and privacy.
04.11	Describe the World Wide Web (WWW).
04.12	Demonstrate the use of transfer protocols.
04.13	Demonstrate the use of typical remote access mechanisms.
04.14	Describe components of a URL.
04.15	Use Internet tools and utilities effectively.
04.16	Install and configure an Internet browser.
04.17	Install and configure browser add-ons and plug-ins.
05.0	Install, configure, manage, and troubleshoot an operating system. – The student will be able to:
05.01	Identify the fundamental principles of operating systems.
05.02	Describe the general features and uses of current operating systems.
05.03	Compare and contrast features of popular operating systems.
05.04	Identify the names, locations, purposes, and contents of major operating system files.
05.05	Use command line functions and utilities to manage the operating system, including proper syntax and switches.
05.06	Create, view, and manage disks, directories and files, and change file attributes.
05.07	Identify the major operating system utilities, their purpose, location, and options.
05.08	Install major operating systems and bring the operating system to a basic operational level.
05.09	Perform operating system upgrades.
05.10	Create an emergency boot disk with utilities utilizing basic system boot sequences and boot methods.
05.11	Optimize the operating system and major operating system subsystems.

05.12	Distinguish and interpret the meaning of common error codes and startup messages from the boot sequence and identify steps to correct the problems.
05.13	Recognize when to use common diagnostic utilities and tools.
05.14	Select and use system utilities and tools to diagnose, troubleshoot and resolve operating system problems.
05.15	Detect and resolve common operational and usability problems.
05.16	Discuss the network protocols used by operating systems.
05.17	Explain how networking is supported by various operating systems.
05.18	Configure operating systems to connect to a local area network.
05.19	Configure operating systems to connect to and use Internet resources.
05.20	Troubleshoot and diagnose basic network and Internet connectivity problems.
06.0	Create and maintain a database. – The student will be able to:
06.01	Define what a database is and describe the components and structures of relational databases.
06.02	Explain the fundamental concepts of database design.
06.03	Design a relational database with multiple tables.
06.04	Determine the appropriate field data type and field size for fields in a table.
06.05	Create and modify tables, queries, forms and reports.
06.06	Insert, update, and delete data and records.
06.07	Create basic table relationships and relate tables in a database.
06.08	Identify the data elements by which to relate tables.
06.09	Describe foreign keys and their use when relating tables.
06.10	Interpret an entity relationship diagram for modeling a database.
06.11	Describe the purpose of SQL statements.
06.12	Define, describe and implement a query.
06.13	Write and implement basic queries formatted for specific output.
06.14	Retrieve information from a database by using query and filter tools.

06.15	Describe the use of SELECT statements including the use of various JOIN, SUBQUERIES, and conditional expressions.
06.16	Describe the advantages of using an index, and implement different types of indexes on tables.
06.17	Perform basic database maintenance.
06.18	Monitor and analyze database performance.
06.19	Backup and restore a database.
07.0	Demonstrate knowledge of networking technologies. – The student will be able to:
07.01	Identify the advantages and disadvantages of networked and non-network environments.
07.02	Describe current networked environments, such as peer-to-peer and client/server.
07.03	Identify and discuss issues such as security, privacy and redundancy related to networked environments.
07.04	Identify and discuss issues related to naming conventions for domains, hosts, users, email, and network devices.
07.05	Differentiate between telecommunications and data communications.
07.06	List and define the layers in the OSI and TCP/IP network protocol models.
07.07	Identify and describe current relevant IEEE network standards.
07.08	Describe and illustrate the typical logical and physical network topologies, and explain the advantages and disadvantages of each topology.
07.09	Describe the major functions and implementation of LAN hardware protocols such as Ethernet, and identify the physical components currently in use.
07.10	Describe the LAN software protocols in current use.
07.11	Discuss the characteristics of IP addresses and MAC addresses, and mapping between protocol addressing schemes.
07.12	Differentiate between hardware used to implement different network topologies, including bus, ring and star.
07.13	Identify and describe the current cable technologies, including shielded and unshielded twisted-pair, coaxial, and fiber optic, and their features including bandwidth, performance, plenum characteristics, and interference rejection.
07.14	Describe current wireless technologies including Wi-Fi, blue tooth, satellite, microwave, radio and infrared.
07.15	Describe the advantages and disadvantages of wireless and cable technologies, and identify the environments best suited for each technology.
07.16	Describe the functions and characteristics of network connectivity hardware, included hubs, repeaters, bridges, switches, access units, routers, and gateways.
07.17	Describe the hardware needed to connect a local area network to a wide area network and the Internet.

	07.18	Compare and contrast major functions and features of current network operating systems, including directory and other services.
	07.19	Describe the major functions of network server hardware and software components.
	07.20	Install and configure a network server, including the installation of network hardware and software.
	07.21	Describe the major functions of network client hardware and software components.
	07.22	Install and configure network client software on multiple computer platforms with support for multiple network protocols.
	07.23	Describe the function of network storage devices and other peripherals, including NAS, SAN, RAID, tape backup, printers, telecommunications devices, scanners, copiers, imaging devices, and document center equipment.
	07.24	Install and configure storage devices and other peripherals with network access.
	07.25	Install, configure, update and troubleshoot network drivers for network hosts and peripherals.
	07.26	Configure and troubleshoot network protocol stacks.
	07.27	Describe the characteristics of the current wide area network technologies and determine the most suitable WAN technology for a given situation.
08.0	Install, configure, manage, deploy, monitor and troubleshoot a networked server environment. – The student will be able to:	
	08.01	Analyze the business environment and select a server deployment and licensing method.
	08.02	Describe the major steps and issues associated with server deployment and draft a server migration strategy.
	08.03	Describe, install and configure the server deployment tools.
	08.04	Perform data and user backup for migration to a new server environment.
	08.05	Prepare, install and test a reference system including updates, device drivers, and base utilities and applications for the creation of a client image.
	08.06	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.
	08.07	Create, capture, test and manage the custom image of the reference system.
	08.08	Deploy the reference system to client computers in a networked environment.
	08.09	Migrate current applications and user data after deployment and verify and troubleshoot deployment issues.
	08.10	Configure, manage and troubleshoot device drivers, network settings, peripheral devices and printers.
	08.11	Join the client to a domain and configure network policies.
	08.12	Describe methods of creating and maintaining network policies.

08.13	Create, modify, and administer users and groups for clients.
08.14	Configure, manage and troubleshoot client mobile features including configuring mobile devices, power management, disk encryption, wireless networking, VPN and remote access.
08.15	Configure, manage and troubleshoot client access to the network, network resources, and the Internet.
08.16	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.
08.17	Analyze business needs and licensing requirements in the selection of enterprise applications for deployment in networked environment.
08.18	Assess hardware requirements and compatibility with existing applications and devices.
08.19	Perform application performance and compatibility testing and troubleshooting prior to application software installation.
08.20	Install and configure business application.
08.21	Deploy single license applications on a client computer.
08.22	Troubleshoot application software installation and compatibility issues.
08.23	Describe the role of desktop support in a network environment.
08.24	Perform management, testing, and troubleshoot activities.
08.25	Document incidents and support activities.
08.26	Perform post-installation tasks, compatibility and reliability testing, resolve performance issues, and perform a security audit.
08.27	Utilize hardware and software installation tools to perform testing, maintenance and updates.
08.28	Perform support functions for clients, users and deployed applications, including end user support and training.
08.29	Configure, manage and monitor administrative features and security settings.
08.30	Document installed software, conduct license auditing, create a performance baseline, and draft a troubleshooting checklist.
09.0	Foundations of project management. – The student will be able to:
09.01	Describe the steps in planning and managing a project.
09.02	Define an implementation schedule for a project.
09.03	Participate in group discussions.

09.04	Choose appropriate actions in situations that require effective time management.
09.05	Describe a project life cycle from initiation to planning through execution, acceptance, support, quality, budgeting, and closure.
09.06	Understand the factors contributing to risk management planning.
09.07	Understand the cultural, social, international, political and physical aspects of the project environment.
10.0	Perform customer service skills. – The student will be able to:
10.01	Identify and recognize user's state of mind and attitude.
10.02	Determine the customer needs using system analysis strategies.
10.03	Listen to the customer and ask appropriate questions.
10.04	Maintain a professional demeanor when dealing with difficult customers.
10.05	Provide suggested solutions using knowledge base.
10.06	Project professional appearance and demeanor.
10.07	Promote company services, products, and policies when appropriate.
10.08	Use tact when dealing with customers and competitors.
10.09	Maintain professional work ethics and follow policies and procedures.
10.10	Respect customer work space/environment.
10.11	Relate all information to customer in a manner that the customer can understand.
10.12	Set realistic expectations when establishing deadlines for customer solutions.
10.13	Communicate action plan including timelines.
10.14	Recognize the existence of internal/external customers and follow appropriate guidelines for each.

Information Technology Support Specialization Standards	
11.0	Demonstrate proficiency in supporting Windows-based client and network computer systems. – The student will be able to:
11.01	Describe the features and characteristics of a well-deployed and operational client computer in a Windows networked environment.
11.02	Perform baseline measurements, perform security and performance audits on a client computer, and document findings.
11.03	Describe the methods of establishing, configuring and controlling group policies.
11.04	Configure and troubleshoot group policy settings for client computers in a Windows domain.
11.05	Configure, manage and troubleshoot task scheduler, event forwarding and monitoring tools on a Windows client computer.
11.06	Test, configure and schedule Windows updates, patches and service packs prior to and after network-wide deployment.
11.07	Troubleshoot Windows performance, reliability, and security issues.
11.08	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.
11.09	Install, manage and maintain anti-malicious software, firewalls and access control.
11.10	Configure, troubleshoot and secure network protocols and services for Windows client computers.
11.11	Configure, enable, manage and troubleshoot VPN, mobile and remote access.
11.12	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.
11.13	Determine whether problems are a result of hardware issues, Windows issues, application failures, user errors or other reasons.
11.14	Monitor events in an enterprise network and log incidents.
12.0	Demonstrate proficiency in installing, configuring, deploying, and supporting desktop applications. – The student will be able to:
12.01	Perform advanced office application functions using word processing, spreadsheet, database, presentation, email, and web applications.
12.02	Test functionality and compatibility of desktop applications and updates with operating system and the intended enterprise use.
12.03	Demonstrate the common steps to install desktop applications.
12.04	Configure and deploy desktop and enterprise applications in a networked environment.
12.05	Administer software license policies, including management of licenses and licensing restrictions, digital signing, and auditing.
12.06	Perform support functions for deployed applications.

12.07	Troubleshoot and resolve desktop application issues in a networked environment.
12.08	Describe how product standards in the IT field emerged.
12.09	Identify methods for evaluation and selection of products.
13.0	Perform help desk support activities. – The student will be able to:
13.01	Describe the various functions, operations, and departments within a business organization such as accounting, payroll, human resources and marketing.
13.02	Describe the role of the IT support function within the business organization.
13.03	Describe the incident management process and help desk service best practices when handling incidents.
13.04	Apply systematic problem-solving and troubleshooting processes to typical end-user issues.
13.05	Discuss the processes for resolving customer issues.
13.06	Describe strategies for handling difficult clients and incidents.
13.07	Identify and select a variety of tools and technologies that aid in the effective management of the help desk function.
13.08	Describe the process of identifying and resolving customer needs within the context of the business enterprise.
13.09	Describe the training process of end users and effective methods of delivering training materials.
13.10	Present and follow oral and written instructions.
13.11	Participate in group discussions as an IT support specialist and trainer.
13.12	Describe the types of end user documentation and the process of developing technical instructions for end users.
13.13	Prepare, outline, and deliver a short IT training presentation.
13.14	Use appropriate communication skills, courtesy, manners, and dress in the workplace.
13.15	Customize application features to meet user needs and to comply with ADA.
14.0	Demonstrate proficiency in supporting Windows users. – The student will be able to:
14.01	Configure the Windows interface and customize application features to meet user needs, including ADA accessibility.
14.02	Configure and modify default user settings in Windows and applications to maximize user performance and to comply with business policies.
14.03	Manage, maintain and backup Windows client computers according to business procedures and user needs without adversely affecting workplace activities.

14.04	Migrate user data, settings and profile to a newly deployed and configured Windows computer.
14.05	Configure, maintain and troubleshoot user account control and authentication issues, including resetting passwords, recovering encryption keys, modifying user accounts and group policies, and elevating privileges.
14.06	Determine whether a client is receiving regularly scheduled updates and resolve issues.
14.07	Configure and troubleshoot user access to network resources.
14.08	Perform a system recovery on a user computer and backup user data.
14.09	Describe methods of understanding and managing user's needs and expectations.

Information Technology Analysis Specialization Standards	
11.0	Perform systems monitoring activities. – The student will be able to:
11.01	Create and review back up, server, application, resolution, and security logs.
11.02	Create and review server logs.
11.03	Create and review application logs.
11.04	Create and review resolution logs.
11.05	Create and review security logs.
11.06	Track network performance.
11.07	Identify problem trends and create resolution plans.
11.08	Document statistical analysis and monitoring activities.
12.0	Perform computer information systems analysis activities. – The student will be able to:
12.01	Prepare appropriate systems and analysis charts and other visual aids.
12.02	Describe the major steps in the systems development cycle.
12.03	Perform basic business related tasks using the most appropriate software applications.
12.04	Identify situations where software packages and/or custom developed packages need to be integrated with each other.
12.05	Identify situations where software packages and/or hardware need to be integrated with software/hardware available on other types of computers.
12.06	Select appropriate hardware devices to accomplish assigned tasks.
12.07	Identify appropriate vendor sources for software, hardware and auxiliary supplies.

Mobile Device Technology Analysis Specialization Standards	
11.0	Configure, manage and troubleshoot Windows client mobile features including configuring mobile devices, power management, disk encryption, wireless networking, VPN and remote access.
	11.01 Describe mobile device technology.
	11.02 Identify the security measures required for securing mobile devices.
	11.03 Identify mobile device operating systems.
	11.04 Distinguish between mobile device operating systems.
	11.05 Setup and configure mobile devices.
	11.06 Explain the basic differences between mobile devices and how they affect good application design.
	11.07 Explain the differences between smart phones, tablets, phablets as it relates to good mobile app design.
12.0	Configure, enable, manage and troubleshoot VPN, mobile and remote access.
	12.01 Identify threats associated with VPN, mobile and remote access.
	12.02 Identify the safety control of remote access.
	12.03 Distinguish between safety countermeasures related to remote access.
	12.04 Setup and configure VPN, mobile and remote access.
	12.05 Troubleshoot technical problems with VPN, mobile and remote access.

Geographic Information System Specialization Standards
11.0 Perform general computer application activities. – The student will be able to:
11.01 Select the most efficient method of file organization for a given situation.
11.02 Identify security procedures to maintain integrity of files.
11.03 Create reports using a word processing application.
11.04 Analyze numerical information using a spreadsheet application.
11.05 Create a database for storing information using a database application.
11.06 Communicate using an e-mail program.
11.07 Retrieve information from the Internet.
12.0 Demonstrate an understanding of geographic coordinate systems. – The student will be able to:
12.01 Differentiate between different models for the shape of the earth.
12.02 Describe the characteristics of a global coordinate system.
12.03 Describe the characteristics of a geographic datum.
12.04 Compare and contrast different map projections.
12.05 Detail the characteristic of the Cartesian coordinate system.
12.06 Detail the UTM, UPS and State Plane coordinate systems.
13.0 Perform map creation activities. – The student will be able to:
13.01 Set the appropriate geographic coordinate system for a map in the GIS application.
13.02 Add geographic data layers to a GIS application.
13.03 Manipulate data files that do not align correctly.
13.04 Symbolize each layer appropriately.
13.05 Label map features as needed.
13.06 Add map components such as legends, titles, scale bars, north arrows.
13.07 Publish the complete map in paper and electronic formats.

14.0	Perform GIS data file creation activities. – The student will be able to:
	14.01 Subset existing GIS data files to create new files.
	14.02 Combine existing, adjacent GIS data files together to create new files.
	14.03 Collect coordinate information using a GPS receiver in the correct geographical coordinate system.
	14.04 Create new GIS data files using coordinate information.
	14.05 Register aerial photographs or satellite images to a specific geographical coordinate system.
	14.06 Create new GIS data files by digitizing on top of registered images.
15.0	Perform GIS data file manipulation activities. – The student will be able to:
	15.01 Create, delete and move GIS files between folders and computers.
	15.02 Add metadata to GIS files.
	15.03 Set coordinate system information for a GIS file.
	15.04 Reproject GIS files to different coordinate systems.
	15.05 Add and delete fields to a GIS database.
	15.06 Manipulate values of field within the GIS database.
16.0	Perform GIS spatial analysis activities. – The student will be able to:
	16.01 Generalize maps by merging adjacent areas if they contain the same or similar attributes.
	16.02 Overlay GIS files that cover the same area to create new files.
	16.03 Create buffers around map features.
	16.04 Manipulate digital elevation models (DEM's) to create slope, aspect, view shed and hill shade layers.
	16.05 Create density maps from point features.
	16.06 Interpolate point features to create continuous surfaces.
	16.07 Generate spatial statistics on GIS files.
17.0	Perform database operations. – The student will be able to:
	17.01 Build a relational database.

17.02 Query, display and format data.
17.03 Save, retrieve and run queries.
17.04 Build and format reports.
17.05 Group and summarize data.
17.06 Insert, update, automatically generate and delete data.
17.07 Control transaction processing.
17.08 Create, confirm, modify and remove tables to store data.
17.09 Apply business rules to ensure data integrity.
17.10 Restrict user access to tables.
17.11 Improve query performance.
17.12 Develop programs in PL/SQL.
17.13 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)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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.

Articulation

To be transferable statewide between institutions, this program must have been reviewed, and a “transfer value” assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific articulation agreements with each other.

The following PSAV programs have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

PC Support Services (B070400) – 9 credits

The following industry certifications have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

CompTIA A+ (COMPT001) – 3 credits
CompTIA Server+ (COMPT009) – 3 credits
MCIT Certified IT Professional – Consumer Support Technician (MICRO027) – 3 credits

MCIT Professional - Enterprise Support Technician (MICRO033) – 3 credits
Microsoft Certified Desktop Support Technician (MICRO006) – 3 credits
Microsoft Certified Technology Specialist - Distributed Applications (MICRO047) – 3 credits

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 (0611050101) – 9 credit hours
Geographic Information System CCC (0545070213) – 21 credit hours
Help Desk Support Technician (0511010313) – 16/18 credit hours
Information Technology Analysis (0511010312) – 27/28 credit hours
Information Technology Support Specialist (0511010311) – 18/28 credit hours
Mobile Device Technology (0511010309) – 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**

AS	
CIP Number	1511010308
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1141 – Database Administrators

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.

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 Standards

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 Standards

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 Standards

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: **1511010308**
Program Length: **60 credit hours**
SOC Code(s): **15-1141**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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:
		02.05.1 Base entity type.
		02.05.2 Bridging entity types.

	02.05.3	Composite attribute.
	02.05.4	Multivalued attribute.
	02.05.5	Derived attribute.
	02.05.6	Associative entity type.
	02.05.7	Relationships between entity types.
	02.05.8	Minimum and maximum cardinality constraints.
	02.05.9	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:	
	03.02.1	Data duplication.
	03.02.2	Data redundancy.
	03.02.3	Data integrity.
	03.02.4	Implicit information storage.
	03.02.5	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 Standards	
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 Standards	
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 Standards	
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.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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.

Articulation

To be transferable statewide between institutions, this program must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific articulation agreements with each other.

The following industry certifications have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

Oracle Certified Associate (ORACL001) – 6 credits

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is 60 credit hours according to Rule 6A-14.030, F.A.C.

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 (0511020309) – 15 credit hours
Oracle Certified Database Administrator (0511020307) – 15 credit hours
Oracle Certified Database Developer (0511020308) – 15 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Computer Programming and Analysis**
Career Cluster: **Information Technology**

AS	
CIP Number	1511020101
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1131 – Computer Programmers

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 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.

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 Demonstrate professional development skills.
12.0 Demonstrate employability skills.
13.0 Demonstrate general organizational computing workplace competencies.
14.0 Develop an algorithm that solves a problem.
15.0 Use development methodologies.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Programming and Analysis**
CIP Number: **1511020101**
Program Length: **60 credit hours**
SOC Code(s): **15-1131**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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	Identity 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.
02.0	Perform analysis activities. – The student will demonstrate proficiency in analysis of information technology systems and 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	Evaluate system performance.

	02.12 Demonstrate understanding of technical and operational feasibility issues in determining a system solution.
	02.13 Demonstrate knowledge, skills, and application of information systems to accomplish specific job objectives.
03.0	Perform program design activities. – The student will be able to:
	03.01 Demonstrate proficiency in design of information technology systems.
	03.02 Demonstrate knowledge of computer concepts and terminology.
	03.03 Demonstrate understanding of computer systems architecture including components, networked environments, and operating systems.
	03.04 Develop design specifications.
	03.05 Select a feasible development environment.
	03.06 Validate design specifications.
	03.07 Document design.
	03.08 Communicate design specifications.
	03.09 Develop prototype.
	03.10 Assist in revisions and enhancements of software systems.
04.0	Perform coding activities. – The student will be able to demonstrate proficiency in software fundamentals (including control and data structures utilizing structured and object-oriented programming methodologies) and 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.
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	Demonstrate professional development skills. – The student will be able to:
	11.01 Use on-line resources related to employee job requirements.
	11.02 Understand the importance of continuing development activities such as reading industry journals and magazines; attending trade shows, seminars and other continuing professional development activities; participating in professional organizations and developing professional contacts for future projects.
	11.03 Understand the evolving nature of information technology systems and necessity of flexibility and willingness to implement needed changes.
	11.04 Set career goals/directions.
	11.05 Build mentor relationships.
12.0	Demonstrate employability skills. – The student will be able to:
	12.01 Demonstrate business communication skills such as producing applications, business letters and memos, and resumes.
	12.02 Understand appropriate workplace dress and demeanor for specific corporate cultures.
	12.03 List representative jobs and career paths for people trained in the computer programming field.

	12.04 List several functions of each representative computer programming job and career path.
13.0	Demonstrate general organizational computing workplace competencies. – The student will be able to:
	13.01 Follow oral and written instructions.
	13.02 Prepare, outline, and deliver a short oral presentation.
	13.03 Utilize research skills to obtain appropriate information, graphics and other data needed.
	13.04 Prepare visual material to support an oral presentation.
	13.05 Demonstrate self-motivation and responsibility to complete an activity.
	13.06 Choose appropriate action in situations requiring effective time management.
	13.07 Identify and discuss issues contained within professional codes of conduct.
	13.08 Identify and discuss software licensing, property rights, privacy, encryption and legal liability issues.
14.0	Develop an algorithm that solves a problem. – Students will be able to:
	14.01 List the steps in problem solving.
	14.02 Write pseudocode for sequential control structures.
	14.03 Write pseudocode for selection control structures.
	14.04 Write pseudocode for repetition control structures.
	14.05 Determine efficiency of an algorithm.
	14.06 Determine the complexity of an algorithm.
15.0	Use development methodologies. – Students will be able to:
	15.01 Define the Waterfall methodology.
	15.02 Define the Agile methodology.
	15.03 Compare and contrast Waterfall and Agile methodologies.
	15.04 Develop a simple application using the Waterfall methodology.
	15.05 Develop a simple application using the Agile methodology.

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)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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 Programming Specialist (0511020103) – 18 credit hours
Computer Programmer (0511020200) – 33/36 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**

AS	
CIP Number	1511080103
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other

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.

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: **1511080103**
Program Length: **60 credit hours**
SOC Code(s): **15-1199**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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.

Career and Technical Student Organization (CTSO)

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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.

Articulation

To be transferable statewide between institutions, this program must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific articulation agreements with each other.

The following PSAV programs have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

Web Design (B070500) – 9 credits
Web Programming Services (B079200) – 9 credits

The following industry certifications have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

Adobe Certified Associate - Dreamweaver (ADOBE010) – 3 credits
Adobe Certified Associate - Flash (ADOBE011) – 3 credits
Certified Internet Web (CIW) – Associate Design Specialist (PROSO001) – 6 credits
Certified Internet Web (CIW) – Master Designer (PROSO004) – 6 credits
Microsoft Certified Professional Developer (MCPD) – ASP.NET Developer (MICRO062) – 3 credits
Microsoft Certified Professional Developer (MCPD) – Web Developer (MICRO043) – 3 credits

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is 60 credit hours according to Rule 6A-14.030, F.A.C.

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) – 35/36 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **Network Systems Technology**
Career Cluster: **Information Technology**

AS	
CIP Number	1511100112
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1122 – Information Security Analysts 15-1142 – Network and Computer Systems Administrators 15-1152 – Computer Network Support Specialists

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.

In addition, students will complete the standards in one of the following specializations:

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 Demonstrate a fundamental understanding of computer networking.
03.0 Demonstrate an understanding of common operating system concepts and associated practices.
04.0 Demonstrate fundamental proficiency in network security essentials.
05.0 Demonstrate proficiency in technical communications and workplace protocols.
06.0 Demonstrate a basic understanding of project management concepts and processes.
07.0 Demonstrate workplace-readiness skills.

In addition, students will complete the standards in one of the following specializations:

Network Administration Specialization Standards

08.0 Demonstrate an understanding of the directory services infrastructure and installation.
09.0 Demonstrate an understanding of organizational units and related objects.
10.0 Demonstrate an understanding of group policy.
11.0 Demonstrate an understanding of implementing sites to manage Active Directory replication.
12.0 Demonstrate an understanding of maintaining Active Directory services availability.
13.0 Demonstrate how to install and deploy a server operating system.
14.0 Demonstrate how to provide infrastructure services
15.0 Demonstrate how to provide file and print services.
16.0 Demonstrate how to provide remote and wireless network access.
17.0 Demonstrate how to monitor and maintain network servers and services.
18.0 Demonstrate an understanding of securing data transmission and authentication.
19.0 Demonstrate an understanding of planning for business continuity and high availability.

Network Infrastructure Specialization Standards

08.0 Demonstrate understanding of routing concepts.
09.0 Demonstrate understanding of routing protocols.
10.0 Demonstrate router configuration skills.
11.0 Demonstrate an understanding of LAN design and concepts.
12.0 Demonstrate VLAN configuration skills.
13.0 Demonstrate an understanding of wide area networks (WAN).
14.0 Demonstrate WAN configuration skills.
15.0 Demonstrate an understanding of network security.
16.0 Demonstrate an understanding of remote access.

17.0 Demonstrate an understanding of IP addressing services.
18.0 Demonstrate an understanding of network maintenance, support and troubleshooting.

Network Security/Cybersecurity Specialization Standards

08.0 Demonstrate proficiency in securing network infrastructures and protecting data.
09.0 Demonstrate proficiency in performing security penetration testing.
10.0 Demonstrate proficiency in responding to security incidents.

Network Virtualization Specialization Standards

08.0 Demonstrate an understanding of virtualization concepts.
09.0 Install and configure the virtualization server platform.
10.0 Install, configure and manage virtualized clients.
11.0 Install, configure, and maintain a virtualized application.
12.0 Demonstrate proficiency in managing a virtualization infrastructure.
13.0 Demonstrate proficiency in securing a virtualization infrastructure.

Digital Forensics Specialization Standards

08.0 Demonstrate proficiency in basic and advanced security concepts.
09.0 Demonstrate proficiency in managing hardware involved in imaging and data collection activities.
10.0 Demonstrate proficiency in analyzing common file systems.
11.0 Demonstrate proficiency in performing computer forensics investigations.
12.0 Demonstrate proficiency in performing mobile device forensics.
13.0 Demonstrate proficiency in incident handling and response.
14.0 Identify key pieces of legislation and processes related to digital forensics.
15.0 Demonstrate an understanding of the tasks related to the casework process.

IP Communications Specialization Standards

08.0 Demonstrate an understanding of IP communication theory.
09.0 Demonstrate an understanding of digitizing voice traffic and voice compression standards.
10.0 Demonstrate an understanding of quality of service (QoS) requirements in a converged data and voice network.
11.0 Demonstrate an understanding of IP communications design.
12.0 Demonstrate an understanding of troubleshooting procedures for IP communications.
13.0 Demonstrate an understanding of utilizing advanced Voice over IP (VoIP) and data bundle solutions to provide a single network connection for phone services and high-speed Internet.
14.0 Demonstrate an understanding of using Statistical Analysis System (SAS) sessions to exchange data by using the TCP/IP communications access method.
15.0 Demonstrate how to configure VoIP fax applications for universal access servers.
16.0 Demonstrate an understanding of key concepts for Video over IP.

Advanced Network Infrastructure Specialization Standards

08.0 Demonstrate an understanding of routing concepts.
09.0 Demonstrate an understanding of routing protocols.
10.0 Demonstrate router configuration skills.
11.0 Demonstrate an understanding of LAN design and concepts.
12.0 Demonstrate VLAN configuration skills.
13.0 Demonstrate an understanding of network maintenance, support and troubleshooting.

Linux System Administrator Specialization Standards

08.0 Understand and use essential tools.
09.0 Operate running systems.
10.0 Configure local storage.
11.0 Create and configure file systems.
12.0 Deploy, configure, and maintain systems.
13.0 Manage users and groups.
14.0 Manage security.

Florida Department of Education
Student Performance Standards

Program Title: **Network Systems Technology**
CIP Number: **1511100112**
Program Length: **60 credit hours**
SOC Code(s): **15-1122, 15-1142, 15-1152**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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 and execution and data storage.
01.03	Describe and identify 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	Configure and update firmware and ROM-BIOS.
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	Examine and identify the parts of the Windows Registry.

02.0	Demonstrate a fundamental understanding 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 their layers.
02.06	Identify and describe current relevant IEEE network standards.
02.07	Create an IP addressing scheme using Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
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 manage 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	Identify the advantages and use 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	Demonstrate an understanding of common operating system concepts and associated practices. – The student will be able to:
03.01	Describe the components and functions of major operating systems.
03.02	Compare and contrast major functions and features of current network operating systems (including 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	Describe procedures 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	Demonstrate fundamental proficiency in network security essentials. – 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	Describe Denial of Service attacks and means to defend against them.
04.04	Identify the risks and techniques of data loss and its prevention.
04.05	Describe the principles and techniques of securing data storage and transmission.
04.06	Identify 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	Describe the functions and characteristics of firewalls.
04.11	Perform a ping sweep to identify network hosts.
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	Utilize a network protocol analyzer to capture and analyze network traffic for security issues.
05.0	Demonstrate proficiency in technical communications and workplace protocols. – 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	Prepare and deliver a technical presentation.
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	Describe the roles of the network specialist in a business enterprise.
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	Demonstrate a basic understanding of project management concepts and processes. – The student will be able to:
06.01	Examine the organization, planning, and controlling of projects.
06.02	Define Project Integration 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.

Network Administration Specialization Standards	
08.0	Demonstrate an understanding of the directory services infrastructure and installation. – The student will be able to:
08.01	Describe the architecture of Active Directory.
08.02	Discuss how Active Directory works.
08.03	Describe the Active Directory design, plan, and implementation processes.
08.04	Create a forest and domain structure.
08.05	Configure the Domain Name Service (DNS) in an Active Directory environment.
08.06	Raise the functional level of a forest and a domain.
08.07	Create trust relationships between domains.
08.08	Create, manage, and delegate administrative control for organizational units.
09.0	Demonstrate an understanding of organizational units and related objects. – The student will be able to:
09.01	Discuss user, group, and computer accounts.
09.02	Create and manage multiple accounts.
09.03	Implement user principal name suffixes.
09.04	Move objects in Active Directory.
09.05	Plan an account strategy.
09.06	Plan an Active Directory audit strategy.
10.0	Demonstrate an understanding of group policy. – The student will be able to:
10.01	Create and configure group policy objects (GPOs).
10.02	Configure group policy refresh rates and group policy settings.
10.03	Manage GPOs.
10.04	Verify and troubleshoot group policy.
10.05	Delegate administrative control of group policy.

	10.06 Plan a group policy strategy for the enterprise.
	10.07 Configure, deploy and maintain applications using group policy.
	10.08 Monitor and maintain security policies.
	10.09 Prepare and implement group policy strategy and backup/recovery of group policy objects.
11.0	Demonstrate an understanding of implementing sites to manage Active Directory replication. – The student will be able to:
	11.01 Discuss directory services replication.
	11.02 Design and document site topology.
	11.03 Manage site topology.
	11.04 Troubleshoot replication failures.
	11.05 Plan, create and configure a site.
	11.06 Implement the global catalog in Active Directory.
	11.07 Plan and determine the placement and type of domain controllers in Active Directory.
	11.08 Identify the various Operations Master Roles and Global Catalog.
	11.09 Plan the placement of Operations Masters and Global Catalog.
	11.10 Transfer and seize Operations Master Roles.
12.0	Demonstrate an understanding of maintaining Active Directory services availability. – The student will be able to:
	12.01 Create an Active Directory implementation plan for a business enterprise.
	12.02 Implement the Active Directory infrastructure for a business enterprise.
	12.03 Describe the maintenance of the Active Directory.
	12.04 Move and defragment an Active Directory database.
	12.05 Backup and restore an Active Directory.
	12.06 Monitor an Active Directory.

13.0	Demonstrate how to install and deploy a server operating system. – The student will be able to:
13.01	Identify server operating system (OS) versions, editions, features and capabilities.
13.02	Assess server installation readiness by inventorying hardware.
13.03	Describe the methods, options and requirements for a Windows server installation and upgrade.
13.04	Perform an attended and an unattended OS installation.
13.05	Configure basic network settings.
13.06	Configure storage.
13.07	Configure operating systems licensing.
13.08	Describe, identify and choose server roles and role services.
13.09	Perform a system review and troubleshoot installation issues.
13.10	Discuss the system installation.
13.11	Automate server deployments using unattended installation tools and Windows.
13.12	Implement deployment services.
14.0	Demonstrate how to provide infrastructure services. – The student will be able to:
14.01	Describe the purpose and function of Dynamic Host Configuration Protocol (DHCP).
14.02	Install, configure, and authorize the DHCP server role.
14.03	Manage, backup and restore the DHCP Database.
14.04	Configure the DHCP Relay Agent.
14.05	Describe the DNS name resolution process.
14.06	Configure DNS zones, records and replication.
14.07	Integrate DNS servers with Active Directory.
14.08	Configure name resolution for client computers.

15.0	Demonstrate how to provide file and print services. – The student will be able to:
15.01	Design a file sharing strategy.
15.02	Install the file and print server roles and services.
15.03	Manage file sharing security, encryption, redundancy, and offline access.
15.04	Manage disk quotas, file screening and shadow copy services.
15.05	Backup and restore files.
15.06	Configure Distributed File System (DFS) roots, targets and replication.
15.07	Identify and install print drivers.
15.08	Manage printer security, priorities, schedules and pools.
15.09	Publish printers and file shares to Active Directory.
15.10	Monitor and troubleshoot print and file services.
16.0	Demonstrate how to provide remote and wireless network access. – The student will be able to:
16.01	Compare and contrast remote access protocols, wireless standards and network authentication methods.
16.02	Configure static and dynamic routing, Network Address Translation (NAT).
16.03	Configure remote access services, protocols and policies, conditions and settings.
16.04	Configure Remote Access Dial-In User Service (RADIUS).
17.0	Demonstrate how to monitor and maintain network servers and services. – The student will be able to:
17.01	Monitor and compare network and server performance data to establish and document baselines, isolate problems and optimize performance, adaptability, and scalability.
17.02	Optimize traffic flow conditions on network connections based on analysis of traffic types, characteristics and user needs.
17.03	Monitor event logs for information, errors and warnings.
17.04	Maintain system documentation and service histories.
17.05	Configure server and client settings to implement patch management strategy.
17.06	Develop strategies for remote server management using command-line and GUI tools.

18.0	Demonstrate an understanding of securing data transmission and authentication. – The student will be able to:
	18.01 Explain the social, ethical and technical issues regarding data integrity and confidentiality.
	18.02 Secure network traffic using IPSec.
	18.03 Configure network authentication.
	18.04 Install, configure and manage certificate services.
	18.05 Describe and deploy a network access protection strategy.
	18.06 Configure firewall settings.
	18.07 Identify ports and protocols and create filters for incoming and outgoing traffic.
19.0	Demonstrate an understanding of planning for business continuity and high availability. – The student will be able to:
	19.01 Discuss virtualization architectures.
	19.02 Estimate data storage requirements.
	19.03 Select a storage technology.
	19.04 Plan for storage fault tolerance.
	19.05 Develop strategies to ensure application and service availability.
	19.06 Plan for backup and recovery of data, servers, and directory services.

Network Infrastructure Specialization Standards	
08.0	Demonstrate an understanding of routing concepts. – The student will be able to:
08.01	Describe the purpose, architecture, and operations of a router.
08.02	Identify the hardware and software components of routers.
08.03	Explain the purpose and nature of routing tables.
08.04	Describe administrative distance and routing metrics such as hop counts and cost.
08.05	Describe how a router determines a path and switches packets.
08.06	Differentiate between static and dynamic routing.
08.07	Explain the differences between class-full and classless routing.
08.08	Describe the use and operation of VLSM and CIDR.
08.09	Describe how a network converges.
09.0	Demonstrate an understanding of routing protocols. – The student will be able to:
09.01	Describe the characteristics of distance vector routing protocols.
09.02	Describe the characteristics of link state routing protocols.
09.03	Describe the differences between distance vector and link state routing protocols and determine the best routing protocol to use in a given situation.
09.04	Describe the features and operation of current internal and external routing protocols.
10.0	Demonstrate router configuration skills. – The student will be able to:
10.01	Configure and verify router interfaces.
10.02	Perform basic router configuration using the Command Line Interface (CLI) to inspect the operations of the router.
10.03	Design and implement a classless IP addressing scheme for a network.
10.04	Configure a router for RIP version 2 operation.
10.05	Use advanced configuration commands with routers.
10.06	Configure a router for OSPF routing in a network.

	10.07 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.
	10.08 Verify and troubleshoot router operations in an OSPF network.
	10.09 Configure and modify metric on a router to improve network performance.
	10.10 Configure summarization and default route settings on a router to optimize network performance.
	10.11 Verify and troubleshoot router operations in complex network environment.
11.0	Demonstrate an understanding of LAN design and concepts. – The student will be able to:
	11.01 Identify the layers and functions of switched network architecture.
	11.02 Describe the principles and benefits of a hierarchical network design.
	11.03 Explain the technology and media access control method for Ethernet networks.
	11.04 Describe the issues associated with Layer 2.
	11.05 Describe the operation of a LAN switch.
	11.06 Describe the benefits of Virtual Local Area Networks (VLAN).
	11.07 Identify and describe the different VLAN encapsulation protocols and their operation.
	11.08 Describe the purpose and operation of VLAN Trunking Protocol (VTP) in the management of a switched network domain.
	11.09 Describe the purpose and operation of Spanning Tree Protocol (STP), and its variants.
	11.10 Describe the use of Inter-VLAN routing to connect different Networks in a switch-based network topology.
	11.11 Analyze business requirements and design a LAN structure to meet those requirements.
	11.12 Discuss quality-of-service considerations and switching prioritization.
12.0	Demonstrate VLAN configuration skills. – The student will be able to:
	12.01 Perform and verify initial LAN switch configuration tasks including remote access management, switch port modes, and trunks.
	12.02 Configure, verify, and troubleshoot VLANs on a LAN switch.
	12.03 Implement a VLAN Domain by configuring LAN switches for VTP network operation.
	12.04 Configure a router to provide Inter-VLAN routing using multiple physical interfaces, and on a single physical interface with sub-interfaces.

12.05	Configure and troubleshoot STP and its variants on a switched network environment.
12.06	Configure and verify the bridge to optimize STP.
12.07	Establish and configure port priorities.
12.08	Troubleshoot and resolve issues with STP operations.
12.09	Manage router and switch OS software.
13.0	Demonstrate an understanding of wide area networks (WAN). – The student will be able to:
13.01	Describe WAN and MAN topologies.
13.02	Differentiate between WAN and LAN topologies.
13.03	Identify and describe WAN protocols.
13.04	Describe the impact of applications (Voice Over IP, Video Over IP) on a network.
13.05	Identify major network issues associated with the Internet, intranets and extranets.
13.06	Explain the differences between the use of leased lines, packet-switched, and circuit-switched technologies.
13.07	Describe typical WAN links and discuss bandwidth considerations.
13.08	Identify and manage licensing.
14.0	Demonstrate WAN configuration skills. – The student will be able to:
14.01	Configure and verify Point-to-Point WAN connection.
14.02	Configure and verify a packet switched WAN connection.
14.03	Configure and verify a basic WAN serial connection and a PPP connection between routers.
14.04	Configure and verify a PPP connection between routers.
14.05	Troubleshoot WAN implementation issue.
14.06	Implement LAN/WAN connections, including virtual private networks (VPN), and tunneling.

15.0	Demonstrate an understanding of network security. – The student will be able to:
15.01	Implement basic switch security measures such as port security, trunk access, and management VLANs.
15.02	Identify current network security threats and explaining how to implement a comprehensive security policy to mitigate common threats to network devices, hosts, and applications.
15.03	Describe the functions of common security appliances and applications.
15.04	Implement recommended security practices to secure network devices.
15.05	Discuss the functions of authentication servers.
15.06	Describe the function and use of Access Control Lists (ACLs).
15.07	Verify, monitor, and troubleshoot ACLs in a network environment.
16.0	Demonstrate an understanding of remote access. – The student will be able to:
16.01	Compare and contrast remote access protocols, wireless standards and network authentication methods.
16.02	Configure static and dynamic routing and Network Address Translation (NAT).
16.03	Configure remote access services, protocols and policies, conditions and settings.
16.04	Describe Remote Access Dial-In User Service (RADIUS).
16.05	Monitor and troubleshoot remote access.
17.0	Demonstrate an understanding of IP addressing services. – The student will be able to:
17.01	Describe the purpose and operation of DHCP and DNS in a networked environment.
17.02	Configure, verify, and troubleshoot DHCP and DNS operation on a router.
17.03	Describe the operation and use of NAT and Port Address Translation (PAT) to provide Internet access to Private IP Address networks.
17.04	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.
17.05	Describe the purpose and operation of IPv6.
17.06	Configure, verify, and troubleshoot IPv6 routing in a network.

18.0	Demonstrate an understanding of network maintenance, support and troubleshooting. – The student will be able to:
18.01	Identify, interpret and maintain network documentation, procedures and practices.
18.02	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
18.03	Follow standard operating procedures for troubleshooting hardware and software.
18.04	Manage, maintain and backup router and switch system and configuration files.
18.05	Recognize and resolve hardware and software configuration problems.
18.06	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.
18.07	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.
18.08	Use network monitoring and management tools effectively to integrate and manage network resources.
18.09	Explain SNMP and its use in monitoring a network.
18.10	Configure network devices to send SNMP traps or alerts to network management systems.
18.11	Establish and document a network baseline.
18.12	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.
18.13	Describe optimization of traffic flow conditions on network connections based on analysis of traffic types, characteristics and user needs.

Network Security/Cybersecurity Specialization Standards	
08.0	Demonstrate proficiency in securing network infrastructures and protecting data. – The student will be able to:
08.01	Explain the major categories of computer crimes and attacks.
08.02	Identify vulnerabilities inherent in network devices, protocols and services.
08.03	Develop institutional security policies and practices in compliance with relevant governmental standards and regulations.
08.04	Implement protective measures in securing critical information assets.
08.05	Deploy various network security related equipment including, firewalls, intrusion prevention systems, and proxies.
08.06	Secure critical network services such as Directory Services, Domain Name Service (DNS), Dynamic Host Configuration Protocol (DHCP), and File Transfer Protocol (FTP).
08.07	Secure desktop client operating systems against viruses, malware and other malicious attacks.
08.08	Detect malicious and abnormal activities through logs, intrusion detection systems and other utilities and appliances.
09.0	Demonstrate proficiency in performing security penetration testing. – The student will be able to:
09.01	Identify organizational compliance with regulatory and legislative Information Assurance (IA) requirements.
09.02	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.
09.03	Test the network perimeter defense mechanisms to ensure boundaries.
09.04	Simulate methods that intruders use to gain unauthorized access to an organization's networked systems and attempted to compromise them.
09.05	Deploy proprietary and/or open source tools to test known technical vulnerabilities in networked systems.
09.06	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.
09.07	Recommend procedures to mitigate against discovered vulnerabilities and security gaps.
09.08	Prepare penetration testing deliverables including reports, documentations.
09.09	Describe the ethics of a licensed Penetration Tester.
10.0	Demonstrate proficiency in responding to security incidents. – The student will be able to:
10.01	Explain contingency planning and its components.
10.02	Collect data from logs and other resources to aid in detecting security incidents.
10.03	Assemble an incident response plan.
10.04	Recover from incidents by restoring services and processes.
10.05	Manage evidentiary data in an electronic environment.

Network Virtualization Specialization Standards	
08.0	Demonstrate an understanding of virtualization concepts. – The student will be able to:
08.01	Describe the purpose, uses and software features of computer virtualization.
08.02	Identify and describe virtualization products, applications and services.
08.03	Identify compatibility issues among hardware and software products.
08.04	Identify the elements necessary for a Virtual Desktop Infrastructure.
08.05	Explain the benefits and considerations for virtual storage, including local host disk, iSCSI SAN, Fibre Channel SAN, and NFS SAN.
08.06	Explain storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.
08.07	Describe backup, recovery, disaster recovery, business continuity, and replication concepts.
08.08	Describe the policies and profile management which restrict and allow features.
08.09	Identify and modify desktop catalogs, groups, and a master virtual machine.
09.0	Install and configure the virtualization server platform. – The student will be able to:
09.01	Install and configure the virtualization platform.
09.02	Install and configure the virtualization environment to create a new farm or join an existing farm.
09.03	Automate virtual machine and cluster deployment.
09.04	Monitor and maintain license usage requirements and trends.
09.05	Manage virtualization networking and storage.
09.06	Manage user sessions from the administrative console.
09.07	Configure network connectivity and storage for the virtualization software.
10.0	Install, configure and manage virtualized clients. – The student will be able to:
10.01	Identify requirements for virtual machines according to task.
10.02	Configure the virtual environment and the virtual machine properties.
10.03	Install, configure and manage a virtual machine desktop client and a virtualized server.

10.04	Manually deploy and migrate virtual machines.
10.05	Configure and assign users to pooled virtual desktops and dedicated virtual desktops.
10.06	Convert physical machines to virtual machines.
10.07	Configure desktop resources for access by users.
10.08	Configure and monitor back up virtual machine data to shared storage.
10.09	Migrate, convert, and monitor virtual machines.
10.10	Create and update shared disks.
11.0	Install, configure, and maintain a virtualized application. – The student will be able to:
11.01	Install and configure a virtualized application.
11.02	Configure virtualization applications to use a proxy.
11.03	Configure virtualized application resources for access by users.
11.04	Install and use profiling software on a virtualized application for streaming, and linking dependent profiles to allow interaction between streamed applications.
11.05	Monitor virtualization applications and implementing policies.
11.06	Migrate, convert, and monitor virtual appliances.
11.07	Test policies to verify the achievement of the desired effect.
11.08	Configure and deliver a plug-in package, and verifying that self-service applications can be added from a client device.
11.09	Install and configure provisioning services.
11.10	Optimize a provisioning services server.
11.11	Describe end user optimization techniques.
12.0	Demonstrate proficiency in managing a virtualization infrastructure. – The student will be able to:
12.01	Manage user access to virtualized applications and machines in the virtualization infrastructure.
12.02	Manage the infrastructure to provide high availability and data access.
12.03	Describe administration of the virtualization environment.

12.04	Describe tools that can be used to monitor virtualization application servers and sessions.
12.05	Manage and maintain network infrastructure and storage resources.
12.06	Create and apply worker groups.
12.07	Configure and optimize load management.
12.08	Configure a resource pool for optimal performance.
12.09	Troubleshoot infrastructure problems and virtual environment issues.
12.10	Resolve application compatibility issues.
13.0	Demonstrate proficiency in securing a virtualization infrastructure. – The student will be able to:
13.01	Describe the securing and maintenance of a virtualization solution.
13.02	Restrict and protect administrator access to the virtualization solution.
13.03	Ensure that the hypervisor is properly secured.
13.04	Create a plan for the security for a virtualization solution before installing, configuring and deploying it.
13.05	Secure elements of a virtualization solution and maintain their security.

Digital Forensics Specialization Standards	
08.0	Demonstrate proficiency in basic and advanced security concepts. – The student will be able to:
08.01	Demonstrate an understanding of cybersecurity, including its origins, trends, culture, and legal implications.
08.02	Describe the basic categories of vulnerabilities associated with cybersecurity (i.e., hardware, software, network, human, physical, organizational).
08.03	Describe the role of digital certificates and their role in IT security.
08.04	Describe network-based IDS, its capabilities, and its approaches to detection (i.e., anomaly, signature).
08.05	Describe the use of firewalls and other means of intrusion prevention.
08.06	Describe security design principles and their role in limiting points of vulnerability.
08.07	Discuss authentication methods and strategies.
08.08	Describe the processes involved in hardening a computer system or network.
08.09	Compare and contrast the forms, limitations, and vulnerabilities associated with centralized and decentralized key management schemas, including the PKI web of trust model.
08.10	Evaluate an existing security posture and identify gaps and vulnerabilities in security.
08.11	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.
08.12	Compare and contrast the processes of black box versus white box penetration testing, including their characteristics, limitations, and appropriateness.
08.13	Describe common testing methodologies and standards used in penetration testing.
08.14	Demonstrate proficiency in basic forensic concepts.
08.15	Describe the range of testing/evaluation and associated tools used to monitor mitigation control effectiveness.
08.16	Create a risk management framework.
08.17	Describe the purpose and scope of an Information Systems Contingency Plan (ISCP).
08.18	Identify the five main components of a contingency plan (i.e., Supporting Information, Activation and Notification, Recovery, Reconstitution, and Appendices).
08.19	Describe the purpose and scope of an IT security disaster recovery plan.
08.20	Describe the purpose and scope of an IT security business continuity plan.
08.21	Describe the four phases of forensic analysis and discuss the activities performed in each phase.

08.22	Describe the forensic and evidentiary considerations when determining containment.
08.23	Describe the types and sources of data collected for forensic analysis.
08.24	Explain the various forms of data and associated collection/retrieval tools for the application transport, IP, and link layers.
08.25	Describe the essential elements of forensic analysis.
09.0	Demonstrate proficiency in managing hardware involved in imaging and data collection activities. – The student will be able to:
09.01	Discuss the different types of Motherboard Connections.
09.02	Explain the components that comprise a Motherboard and their functions.
09.03	Describe the different types of permanent storage.
09.04	Compare and contrast the different host interface standards.
09.05	Describe how Solid State storage processes differ from traditional storage.
09.06	Discuss the different types of removable media and their impacts on data collection.
09.07	Explain the concepts of RAID including the different Levels and their impacts on the imaging and collection process.
09.08	Compare and contrast the read/write process of both permanent and temporary storage devices.
09.09	Compare the standard boot process to the Forensic/controlled boot process.
10.0	Demonstrate proficiency in analyzing common file systems. – The student will be able to:
10.01	Define the Master Boot Record (MBR) and discuss its purpose and any important items that it may contain.
10.02	Explain the purpose of the Boot Parameter Block (BPB) and its components.
10.03	Discuss the different File Systems available in an OS environment. Identify the strengths and weaknesses of each system.
10.04	Explain the process of file creation and deletion in an OS environment including the concept of file artifacts.
10.05	Discuss the formatting process in an OS environment.
10.06	Explain pertinent OS system files related to data storage and their functions.
10.07	Discuss how Windows handles the concept of Date and Time in relation to file management and how it differs from UNIX-like operating systems.
10.08	Define the different file systems that can be used with removable media.

	10.09 Explain the concepts of Open and Closed sessions.
11.0	Demonstrate proficiency in performing computer forensics investigations. – The student will be able to:
	11.01 Create security incident handling and response policies.
	11.02 Recover deleted, encrypted, or damaged file information as evidence for civil or criminal cases.
	11.03 Deploy proprietary and/or open source tools to identify an intruder's footprints.
	11.04 Coordinate incident response activities in cooperation with law enforcement agencies.
	11.05 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.
	11.06 Preserve forensic integrity of evidence so they can be admissible in court.
	11.07 Describe moral and ethical standards in conducting digital forensics investigations.
12.0	Demonstrate proficiency in performing mobile device forensics. – The student will be able to:
	12.01 Preserve, acquire, and examine data stored on mobile devices.
	12.02 Perform forensic acquisition and examination of SIM cards.
	12.03 Apply forensic principles and tools to mobile and IoT devices.
	12.04 Demonstrate proficiency in using open-source and proprietary mobile device forensics tools.
	12.05 Compare forensic acquisition tools and validate the completeness and accuracy of results.
	12.06 Describe forensic acquisition and examination of GPS navigation devices.
	12.07 Utilize the results from mobile device forensics for internal investigations or in civic/criminal litigation.
13.0	Demonstrate proficiency in incident handling and response. – The student will be able to:
	13.01 Design an incident response plan including: assessment, communication, containment, evaluation, recovery, and documentation.
	13.02 Describe information-hiding techniques.
	13.03 Describe the steps required to collect, seize, and protect evidence.
	13.04 Recover data from various storage devices after physical and/or logical damage.
	13.05 Search and report on memory in real time with live and system forensics.

13.06	Investigate network traffic using log files, time analysis, sniffers, and other traffic analysis tools.
13.07	Explain the legal considerations to investigating emails as prescribed in the Electronic Communications Privacy Act.
13.08	Identify email tracing techniques in forensic investigations.
14.0	Identify key pieces of legislation and processes related to digital forensics. – The student will be able to:
14.01	Describe the importance of creating an accurate representation of the facts.
14.02	Explain the components of the Discovery Process.
14.03	Discuss the 4th Amendment and its impact on the digital forensics investigative process.
14.04	Identify laws and court cases related to computer forensics and their impacts on the investigation process.
14.05	Identify and explain the basic Federal Rules of Evidence.
14.06	Compare and contrast the different qualifications required to be a licensed computer forensics professional from state to state.
14.07	Define the concept of a subpoena and explain the process of how one is obtained.
14.08	Explain the steps required to acquire a search warrant.
14.09	Discuss the concept of consent and the ways that it can be granted.
14.10	Compare the legal process for civil and criminal cases.
14.11	Define the concept of expert testimony and the process involved in being classified as an expert.
14.12	Discuss appropriate courtroom behavior.
15.0	Demonstrate an understanding of the tasks related to the casework process. – The student will be able to:
15.01	Explain the steps involved in maintaining the integrity of digital evidence.
15.02	Discuss the process of creating a forensics image.
15.03	Define hashing and explain its uses in ensuring image authenticity.
15.04	Describe sector slack space and its potential impact on evidence gathering.
15.05	Describe the importance of documenting the examination process.
15.06	Explain control/security access logs for images and their importance in maintaining evidence.

15.07	Describe the steps involved in preparing evidence and documents for trial.
15.08	Explain the procedures involved in creating a digital forensics investigation report including examples of report formats.
15.09	Discuss the importance of the Summation and Analysis sections of the digital investigation report.

IP Communications Specialization Standards	
08.0	Demonstrate an understanding of IP communication theory. – The student will be able to:
	08.01 Describe the supported multivendor hardware platforms for VoIP technology, their limits, and their boundaries.
	08.02 Describe how Voice Gateways function in an IP Telephony (IPT) solution.
	08.03 Identify and describe the Local Area Network (LAN) switching products useable in an IPT solution.
09.0	Demonstrate an understanding of digitizing voice traffic and voice compression standards. – The student will be able to:
	09.01 Identify the steps required for analog to digital conversion in a VoIP network.
	09.02 Identify the signaling steps required to complete a Public Switched Telephone Network (PSTN) call.
	09.03 Define the function of Private Branch eXchanges (PBX) or key systems.
	09.04 Configure Foreign eXchange Subscriber (FXS) and Foreign eXchange Office (FXO) interfaces on a Voice Gateway.
10.0	Demonstrate an understanding of Quality of Service (QoS) requirements in a converged data and voice network. – The student will be able to:
	10.01 Identify the steps required to minimize jitter, packet loss and serialization delay in a VoIP network.
	10.02 Explain the function of IP precedence and different Class of Service (CoS) types.
	10.03 Identify and list the types of traffic coming into the interface and defining their relative priority.
	10.04 Configure a priority or custom queuing list.
11.0	Demonstrate an understanding of IP communications design. – The student will be able to:
	11.01 Identify the most appropriate gateway in IP communication design.
	11.02 Identify and describe dial plan architecture in IP communication design.
	11.03 Identify the correct route patterns, filters, and use of wild cards in VoIP design scenarios.
	11.04 List available classes of services in IP communication design and their constraints.
	11.05 Describe how to use digit manipulation in VoIP design.
	11.06 Identify the appropriate QoS tools needed for the proper operation of voice traffic on a network.

12.0	Demonstrate an understanding of troubleshooting procedures for IP communications. – The student will be able to:
	12.01 Identify the appropriate method for providing redundancy in VoIP design.
	12.02 Describe the tools used in troubleshooting IP communication networks.
	12.03 Identify and describe the different call flows and series of events through the call traces and debug outputs when troubleshooting.
	12.04 List the alarms used in IP communication troubleshooting.
13.0	Demonstrate an understanding of utilizing 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:
	13.01 Identify the required bandwidth speeds needed for uninterrupted service and fast uploads and downloads.
	13.02 Describe the impact of voice samples, codecs, and packet size on bandwidth.
	13.03 Describe on demand use of voice/data and voice prioritization, delivered over a private/secure line.
	13.04 Describe features for a VoIP and data bundle.
	13.05 Describe VoIP and data bundle used to dynamically alternate between voice and Internet as call volume needs dictate.
14.0	Demonstrate an understanding of using Statistical Analysis System *(*SAS) sessions to exchange data by using the TCP/IP communications access method. – The student will be able to:
	14.01 Identify that a SAS/SHARE server ID has been added to the TCP/IP SERVICES file.
	14.02 Describe how to invoke SAS sessions utilizing TCP/IP communications access method.
	14.03 Describe syntax used to identify port numbers, defined in the client TCP/IP SERVICES file.
15.0	Demonstrate how to configure VoIP fax applications for universal access servers. – The student will be able to:
	15.01 Describe fax applications that enable universal access servers to send and receive faxes across packet-based networks using modems.
	15.02 Describe universal inbox applications for fax and email and how faxes and emails can go to the same mailbox using direct inward dialing.
	15.03 Describe how to broadcast a fax to multiple recipients simultaneously.
16.0	Demonstrate an understanding of key concepts for Video over IP. – The student will be able to:
	16.01 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.
	16.02 Describe the quality of service requirements which must be fulfilled for use in broadcast carrying video over IP networks.
	16.03 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.
16.04	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 Standards	
08.0	Demonstrate an understanding of routing concepts. – The student will be able to:
08.01	Describe the purpose, architecture, and operations of a router.
08.02	Identify the hardware and software components of routers.
08.03	Explain the purpose and nature of routing tables.
08.04	Describe administrative distance and routing metrics such as hop counts and cost.
08.05	Describe how a router determines a path and switches packets.
08.06	Differentiate between static and dynamic routing.
08.07	Explain the differences between class-full and classless routing.
08.08	Describe the use and operation of Variable Length Subnet Masks (VLSM) and Classless Inter-Domain Routing (CIDR).
08.09	Describe how a network converges.
09.0	Demonstrate an understanding of routing protocols. – The student will be able to:
09.01	Describe the characteristics of distance vector routing protocols.
09.02	Describe the characteristics of link state routing protocols.
09.03	Describe the differences between distance vector and link state routing protocols, and determine the best routing protocol to use in a given situation.
09.04	Describe the features and operation of current internal and external routing protocols.
09.05	Determine network resources needed for implementing various routing protocols.
10.0	Demonstrate router configuration skills. – The student will be able to:
10.01	Configure and verify router interfaces.
10.02	Perform basic router configuration and using the Command Line Interface (CLI) to inspect the operations of the router.
10.03	Design and implement a classless IP addressing scheme for a network.
10.04	Use advanced configuration commands with routers.

10.05	Configure OSPF, EIGRP, BGP, eBGP, RIPv2, and RIPng routing in a network.
10.06	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.
10.07	Verify and troubleshoot router operations in an OSPF network.
10.08	Configure and modify metric on a router to improve network performance.
10.09	Configure summarization and default route settings on a router to optimize network performance.
10.10	Verify and troubleshoot router operations in complex network environment.
10.11	Create an EIGRP implementation plan.
10.12	Create an EIGRP verification plan.
10.13	Verify an EIGRP solution was implemented properly using show and debug commands.
10.14	Document and verify results for an EIGRP implementation.
11.0	Demonstrate an understanding of LAN design and concepts. – The student will be able to:
11.01	Identify the layers and functions of switched network architecture.
11.02	Describe the principles and benefits of a hierarchical network design.
11.03	Explain the technology and media access control method for Ethernet networks.
11.04	Describe the issues associated with Layer 2.
11.05	Describe the operation of a LAN switch.
11.06	Describe the benefits of Virtual Local Area Networks (VLAN).
11.07	Identify and describe the different VLAN encapsulation protocols and their operation.
11.08	Describe the purpose and operation of VLAN Trunking Protocol (VTP) in the management of a switched network domain.
11.09	Describe the purpose and operation of Spanning Tree Protocol (STP), and its variants.
11.10	Describe the use of Inter-VLAN routing to connect different Networks in a switch-based network topology.
11.11	Analyze business requirements and design a LAN structure to meet those requirements.
11.12	Discuss quality-of-service considerations and switching prioritization.

11.13	Describe a VoIP support solution.
11.14	Describe a video support solution.
11.15	Configure port security features.
11.16	Configure general security features.
12.0	Demonstrate VLAN configuration skills. – The student will be able to:
12.01	Perform and verify initial LAN switch configuration tasks including remote access management, switch port modes, and trunks.
12.02	Configure, verify, and troubleshoot VLANs on a LAN switch.
12.03	Implement a VLAN Domain by configuring LAN switches for VTP network operation.
12.04	Configure a Router to provide Inter-VLAN routing using multiple physical interfaces, and on a single physical interface with sub-interfaces.
12.05	Configure and troubleshoot Spanning Tree Protocol and its variants on a switched network environment.
12.06	Configure and verify the bridge to optimize STP.
12.07	Establish and configure port priorities.
12.08	Troubleshoot and resolve issues with STP operations.
12.09	Create a Layer 3 path control implementation plan based upon the results of the redistribution analysis.
12.10	Create a Layer 3 path control verification plan.
12.11	Configure Layer 3 path control.
12.12	Verify that a Layer 3 path control was implemented.
12.13	Document results of a Layer 3 path control implementation and verification plan.
12.14	Describe basic VPN technologies.
12.15	Describe branch access technologies.
12.16	Configure private VLANs.
12.17	Configure VACL and PACL.
12.18	Configure switch-to-switch connectivity for the VLAN based solution.

12.19	Configure loop prevention for the VLAN based solution.
12.20	Configure Access Ports for the VLAN based solution.
12.21	Determine network resources needed for implementing a VLAN based solution on a network.
12.22	Create a VLAN based implementation plan.
12.23	Create a VLAN based verification plan.
12.24	Verify the VLAN based solution was implemented properly using show and debug commands.
12.25	Document the verification after implementing a VLAN solution.
13.0	Demonstrate an understanding of network maintenance, support and troubleshooting. – The student will be able to:
13.01	Identify, interpret and maintain network documentation, procedures and practices.
13.02	Describe effective troubleshooting strategies and techniques to resolve basic hardware, software, and network problems.
13.03	Describe standard operating procedures for troubleshooting hardware and software.
13.04	Identify procedures to manage, maintain and backup router and switch system and configuration files.
13.05	Recognize and resolve hardware and software configuration problems.
13.06	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.
13.07	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.
13.08	Use network monitoring and management tools effectively to integrate and manage network resources.
13.09	Explain RMON and SNMP and their use in monitoring a network.
13.10	Configure network devices to send SNMP traps or alerts to network management systems.
13.11	Establish and document a network baseline.
13.12	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.
13.13	Optimize traffic flow conditions on network connections based on analysis of traffic types, characteristics and user needs.
13.14	Determine network resources needed for implementing a switch based Layer 3 solution.
13.15	Create an implementation plan for the switch based Layer 3 solution.

13.16	Create a verification plan for the switch based Layer 3 solution.
13.17	Configure routing interfaces.
13.18	Configure Layer 3 security.
13.19	Verify the switch based Layer 3 solution was implemented properly using show and debug commands.
13.20	Document the verification results after implementing a switch based Layer 3 solution.
13.21	Develop a plan to monitor and manage a network.
13.22	Perform network monitoring using IOS tools.
13.23	Perform routine IOS device maintenance.
13.24	Isolate sub-optimal internetwork operation at the correctly defined OSI Model layer.
13.25	Troubleshoot EIGRP.
13.26	Troubleshoot OSPF.
13.27	Troubleshoot eBGP.
13.28	Troubleshoot routing redistribution solution.
13.29	Troubleshoot a DHCP client and server solution.
13.30	Troubleshoot NAT.
13.31	Troubleshoot first hop redundancy protocols.
13.32	Troubleshoot IPv6 routing.
13.33	Troubleshoot IPv6 and IPv4 interoperability.
13.34	Troubleshoot switch-to-switch connectivity for the VLAN based solution.
13.35	Troubleshoot loop prevention for the VLAN based solution.
13.36	Troubleshoot access ports for the VLAN based solution.
13.37	Troubleshoot private VLANS.
13.38	Troubleshoot port security.

13.39 Troubleshoot general switch security.
13.40 Troubleshoot VACLs and PACLs.
13.41 Troubleshoot switch virtual interfaces (SVIs).
13.42 Troubleshoot switch supervisor redundancy.
13.43 Troubleshoot switch support of advanced services (i.e., Wireless, VoIP, Video).
13.44 Troubleshoot a VoIP support solution.
13.45 Troubleshoot a video support solution.
13.46 Troubleshoot Layer 3 security.
13.47 Troubleshoot issues related to ACLs used to secure access to Cisco routers.
13.48 Troubleshoot configuration issues related to accessing the AAA server for authentication purposes.
13.49 Troubleshoot security issues related to IOS services (i.e., finger, NTP, HTTP, FTP, RCP).

Linux System Administrator Specialization Standards	
08.0	Understand and use essential tools. – The student will be able to:
08.01	Access a shell prompt and issue commands with correct syntax.
08.02	Use input-output redirection (>, >>, |, 2>). Demonstrate the use of standard-in, standard-out, standard-error, and pipe.
08.03	Demonstrate the use of grep and regular expressions to analyze text.
08.04	Access remote systems using ssh.
08.05	Log in and switch users in multiuser targets.
08.06	Archive, compress, unpack, and uncompress files using a variety of tools.
08.07	Create and edit text files.
08.08	Create, delete, copy, and move files and directories.
08.09	Create hard and soft links.
08.10	List, set, and change standard ugo/rwx permissions.
08.11	Locate, read, and use system documentation including man, info, and files in /usr/share/doc.
09.0	Operate running systems. – The student will be able to:
09.01	Boot, reboot, and shut down a system normally.
09.02	Boot systems into different targets manually.
09.03	Interrupt the boot process in order to gain access to a system.
09.04	Identify CPU/memory intensive processes, adjust process priority with renice, and kill processes.
09.05	Locate and interpret system log files and journals.
09.06	Perform various logging related activities such as configuring logging, log rotation and log reporting.
09.07	Access a virtual machine's console.
09.08	Explain the meaning and use of common metrics such as utilization values for CPU, memory, disk space, disk I/O, and network bandwidth.
09.09	Start and stop virtual machines.

	09.10 Start, stop, and check the status of network services.
	09.11 Securely transfer files between systems.
10.0	Configure local storage. – The student will be able to:
	10.01 List, create, delete partitions on MBR and GPT disks.
	10.02 Create and remove physical volumes, assign physical volumes to volume groups, and create and delete logical volumes.
	10.03 Configure systems to mount file systems at boot by Universally Unique ID (UUID) or label.
	10.04 Create, use and remove snapshots of logical volumes.
	10.05 Add new partitions and logical volumes, and swap to a system non-destructively.
11.0	Create and configure file systems. – The student will be able to:
	11.01 Create, mount, unmount, and using various file systems.
	11.02 Mount and unmount CIFS and NFS network file systems.
	11.03 Extend existing logical volumes.
	11.04 Discuss set UID and GID.
	11.05 Create and manage Access Control Lists (ACLs).
	11.06 Diagnose and correct file permission problems.
12.0	Deploy, configure, and maintain systems. – The student will be able to:
	12.01 Configure networking and hostname resolution statically or dynamically.
	12.02 Schedule tasks using at and cron.
	12.03 Start and stop services and configure services to start automatically at boot.
	12.04 Configure systems to boot into a specific target automatically.
	12.05 Perform an unattended system install.
	12.06 Configure a physical machine to host virtual guests.
	12.07 Install Linux systems as virtual guests.

12.08	Configure systems to launch virtual machines at boot.
12.09	Configure network services to start automatically at boot.
12.10	Configure a system to use time services.
12.11	Install and update software packages from a remote repository or a local file system.
12.12	Update the kernel package appropriately to ensure a bootable system.
12.13	Modify the system bootloader.
13.0	Manage users and groups. – The student will be able to:
13.01	Create, delete, and modify local and global user accounts.
13.02	Change passwords and adjust password aging for local and global user accounts.
13.03	Create, delete, and modify local and global groups and group memberships.
13.04	Configure a system to use an existing authentication service for user and group information.
14.0	Manage security. – The student will be able to:
14.01	Describe security basic concepts and mechanisms, including encryption, password safety, message digests and system security requirements.
14.02	Demonstrate proper security techniques and monitoring.
14.03	Configure firewall settings using firewall-config, firewall-cmd, or iptables.
14.04	Configure key-based authentication for SSH.
14.05	Set enforcing and permissive modes for SELinux.
14.06	List and identify SELinux file and process context.
14.07	Restore default file contexts.
14.08	Use boolean settings to modify system SELinux settings.
14.09	Diagnose and address routine 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.

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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:

Network Server Administration (0511100112) – Primary/Secondary: 24/18 hours
Network Enterprise Administration (0511100113) – Primary/Secondary: 29/26 hours
Network Infrastructure (0511100114) – Primary/Secondary: 21/16 hours
Advanced Network Infrastructure (0511100115) – Primary/Secondary: 36/28 hours
Network Virtualization (0511100116) – Primary: 24/18 hours
Advanced Network Virtualization (0511100117) – Primary/Secondary: 34/27 hours
Network Security (0511100118) – Primary/Secondary: 30/20 hours
Digital Forensics (0511100119) – Primary/Secondary: 32/24 hours
IP Communications (0511100120) – Primary/Secondary: 32/21 hours
Network Support Technician (0511100121) – Primary/Secondary: 21/16 hours

Linux System Administrator (0511100122) – Primary/Secondary: 24/21 hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Florida Department of Education
Curriculum Framework

Program Title: **IT Security**
Career Cluster: **Information Technology**

AS	
CIP Number	1511100307
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1122 – Information Security Analysts

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.

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
SOC Code(s): 15-1122

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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.

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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 CCC (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**

AS	
CIP Number	1511100308
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1212 Information Security Analysts 15-1231 Computer Network Support Specialists 15-1211 Computer System Analysts

Purpose

The 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 the fundamentals of web-based programming, web databases, network security, installing, configuring, monitoring and securing networks 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.

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 network access control systems and methodology.
05.0 Perform coding activities.
06.0 Perform testing activities.
07.0 Demonstrate proficiency with Internet structure, organization, and navigation.
08.0 Perform web design/development activities.
09.0 Perform programming and scripting activities.
10.0 Perform security activities.
11.0 Legal and ethical issues relative to the information technology environment.
12.0 Communications skills.

Florida Department of Education
Student Performance Standards

Program Title: **Cybersecurity**
CIP Number: **1511100308**
Program Length: **60 credit hours**
SOC Code(s): **15-1212, 15-1231, 15-1211**

Refer to Rule 6A-14.030 (4), F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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 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 network 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	Manage policies, rights, permissions, and passwords for users and/or groups of users.
04.05	Demonstrate an understanding of various access control models.
04.06	Manage password, PIN selection, maintenance, and control.
04.07	Demonstrate an understanding of methods of identification and authentication.

	04.08 Implement centralized/remote authentication access controls.
	04.09 Implement and manage decentralized access controls such as domain and trust relationships.
	04.10 Analyze methods of server attacks.
	04.11 Demonstrate an understanding of the different types of intrusions and the different methods of intrusion detection.
	04.12 Monitor the network using various forms of intrusion detection resources to detect attacks.
	04.13 Investigate audit trails for signs of network intrusions.
	04.14 Perform penetration testing to find weaknesses in the access control systems.
05.0	Perform coding activities. - The student will be able to demonstrate proficiency in software fundamentals including control and data structures utilizing structured and object-oriented programming methodologies and will be able to:
	05.01 Identify modules.
	05.02 Design modules.
	05.03 Code modules.
	05.04 Document modules.
	05.05 Test modules.
	05.06 Debugging code.
	05.07 Revise code.
	05.08 Assemble modules.
	05.09 Demonstrate proficient use of programming development tools.
	05.10 Identify and use best practices to secure program code.
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.
07.0	Demonstrate proficiency with Internet structure, organization, and navigation. - The student will be able to:
	07.01 Describe the origin of the Internet.
	07.02 Outline the history of the Internet.
	07.03 Describe Internet organization, such as the InterNIC, domains and requests for comments (RFCs).
	07.04 Describe the structure of the Internet.
	07.05 Differentiate between the Internet and the WWW.
	07.06 Define Internet push technologies, such as e-mail marketing vs. webpage banner advertising.
	07.07 Differentiate among an Intranet site, an extranet site, and an Internet site.
	07.08 Describe and identify several major ethical and legal issues related to Internet use and how they affect intellectual property rights.
	07.09 Describe the World Wide Web (WWW) and identify how it affects personal security and privacy and our society.
	07.10 Describe and differentiate between file types and protocols.
	07.11 Demonstrate the use of typical remote access mechanisms.
	07.12 Describe various sections of a URL.
	07.13 Discuss the use of Internet tools and utilities.
08.0	Perform web design/development activities. - The student will be able to:
	08.01 Describe and use the process of storyboarding a website.
	08.02 Describe format, structure and design principles for websites.
	08.03 Evaluate web graphic utilities and creation tools, including those for animated graphics.

08.04 Identify existing resources and constraints.
08.05 Evaluate design based on current industry and in-house standards.
08.06 Create site navigation plan including directory structure.
08.07 Procure/create and incorporate standard and animated graphics into a webpage.
08.08 Obtain in-house content and determine needs for secondary content providers.
08.09 Design page templates to implement on final site.
08.10 Create a webpage using authoring tools.
08.11 Code page(s) using current web programming languages.
08.12 Check page for cross-browser capability and other access issues.
08.13 Upload pages and run site analysis.
08.14 Incorporate sound files onto a webpage.
08.15 Incorporate a streaming video file onto a webpage.
08.16 Incorporate a video file for download into a webpage.
08.17 Create an animated graphic.
08.18 Perform simple graphic modifications using a graphics utility.
08.19 Incorporate an e-mail link on a webpage.
08.20 Incorporate internal and external links on a webpage.
08.21 Incorporate tables and file transfer capabilities on a webpage.
08.22 Incorporate handicapped-accessibility options into the website.
08.23 Configure a webpage for Search Engine Optimization.
08.24 Create a web form and produce e-mail results.
08.25 Create a web database interface.
08.26 Discuss the issue of ODBC compliance.

09.0	Perform programming and scripting activities. - The student will be able to:
	09.01 Identify several of the most prominent current programming languages.
	09.02 Characterize the stages of the system development life cycle.
	09.03 Differentiate between two common strategies for problem solving.
	09.04 Describe the program design and development process.
	09.05 Differentiate between structured programming and object-oriented programming.
	09.06 Use procedural and object-oriented constructs of programming, scripting, and/or macro languages to create and test programs.
	09.07 Apply principles of good design and documentation when developing programs.
	09.08 Write scripting code to handle error checking in client forms.
	09.09 Write CGI programs to allow for interactions between the client and server.
	09.10 Use scripting languages to create dynamic webpages.
	09.11 Identify development tools and list in order of complexity of use.
	09.12 Design, review, and test specifications and algorithms.
	09.13 Write program according to specifications and revise based on testing and debugging.
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	Legal and ethical issues relative to the information technology environment. - The student will be able to:
11.01	Discuss the types of works that are protected by intellectual property laws.
11.02	Discuss the basic elements of a contract.
11.03	Discuss email litigation, including anti-spam laws.
11.04	Discuss email use and ownership.
11.05	Describe customer and employee privacy issues and safeguards.
11.06	Develop examples of acceptable use policies.
11.07	Compare organizational codes of ethics.
11.08	Research industry standards and codes of conduct for information technology professionals.
11.09	Write a personal code of ethics.
12.0	Communications skills. - The student will be able to:
12.01	Write logical and clear statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
12.02	Read and explain graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
12.03	Deliver and follow oral and written instructions.
12.04	Answer and ask questions coherently and concisely.
12.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
12.06	Demonstrate appropriate communication skills.
12.07	Prepare and deliver a technical presentation.
12.08	Observe and interpret verbal and nonverbal behavior.
12.09	Compose and critique business documents, memorandums, business letters, requests, answer requests, claims/adjustments, and letters using correct English grammar and punctuation.
12.10	Demonstrate effective use of electronic communication.
12.11	Summarize the skills involved in being an effective listener.
12.12	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.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) is the intercurricular career and technical student organization(s) 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.

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: **Technology Project Management**
Career Cluster: **Information Technology**

AS	
CIP Number	1511100509
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other

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.

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**
SOC Code(s): **15-1199**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:		
01.0	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 & 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.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular career and technical student organization(s) 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.

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.

Articulation

To be transferable statewide between institutions, this program must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific articulation agreements with each other.

The following industry certifications have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

CompTIA Project+ (COMPT007) – 3 credits

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is 60 credit hours according to Rule 6A-14.030, F.A.C.

Florida Department of Education
Curriculum Framework

Program Title: **Enterprise Resource Planning (ERP) Software Specialist**
Career Cluster: **Information Technology**

AS	
CIP Number	1511100510
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	11-3021 – Computer and Information Systems Managers

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 ERP specialist, ERP developer, ERP Systems Integration technician, ERP administrator, ERP database specialist, ERP designer, or ERP planner 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 enterprise resource software environments such as SAP, Oracle, PeopleSoft, MAPICS, Great Plains, and others.

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.

Standards

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

01.0 Demonstrate an understanding of Enterprise Resource Planning (ERP) and Electronic Business fundamentals.
02.0 Demonstrate proficiency in developing Enterprise Resource Planning (ERP) systems solutions.
03.0 Demonstrate proficiency in Enterprise Resource Planning (ERP) technical functional requirements.
04.0 Demonstrate proficiency in Enterprise Resource Planning (ERP) project planning.
05.0 Demonstrate proficiency in Enterprise Resource Planning (ERP) project coordination.
06.0 Demonstrate proficiency in developing Enterprise Resource Planning (ERP) customer business function requirements.
07.0 Demonstrate competence in communications with Enterprise Resource Planning (ERP) customers.
08.0 Demonstrate proficiency in business and management processes.
09.0 Demonstrate proficiency with high-level computer programming languages as related to Enterprise Resource Planning (ERP) software.
10.0 Perform general organizational computing workplace competencies.
11.0 Demonstrate employability skills.
12.0 Demonstrate effective communication skills.
13.0 Demonstrate professional development skills.

Florida Department of Education
Student Performance Standards

Program Title: **Enterprise Resource Planning (ERP) Software Specialist**
CIP Number: **1511100510**
Program Length: **60 credit hours**
SOC Code(s): **11-3021**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of Enterprise Resource Planning (ERP) and electronic business fundamentals. – The student will be able to:
01.01	Identify characteristics of the American enterprise system, electronic business (e-commerce), and ERP systems.
01.02	List the types of large-scale business environments that ERP systems support.
01.03	Understand ERP terminology.
01.04	Describe how ERP uses a collection of software applications to manage the entire organization.
01.05	Describe how ERP systems integrate sales, manufacturing, logistics, accounting and other enterprise business functions.
01.06	Describe how ERP systems share common database and business analysis tools.
01.07	Describe how e-commerce has changed society.
01.08	Differentiate between the various e-commerce and ERP business models.
01.09	Identify e-commerce market sectors.
01.10	List factors that contribute to economic growth and impact supply and demand.
01.11	Identify characteristics of different types of business ownership.
02.0	Demonstrate proficiency in developing Enterprise Resource Planning (ERP) systems solutions. – The student will be able to:
02.01	Research available enterprise solutions.
02.02	Review evaluations of comparable ERP software programs and vendors.
02.03	Compare collected data.
02.04	Participate in demonstrations of ERP software programs.

02.05	Assess hardware requirements.
02.06	Assess software requirements.
02.07	Analyze solution integration activities.
02.08	Establish benchmarking and sizing criteria.
02.09	Assist in identifying overall costs.
02.10	Understand the difference and relationship between ERP and Customer Relation Management (CRM) software.
02.11	List and compare implementation costs.
02.12	List and compare training costs.
03.0	Demonstrate proficiency in Enterprise Resource Planning (ERP) technical functional requirements. – The student will be able to:
03.01	Demonstrate understanding of issues related to shared data and integrated databases.
03.02	Design relational databases.
03.03	Develop relational databases.
03.04	Utilize database toolset – GUI.
03.05	Exhibit working knowledge of query language.
03.06	Develop an application that interfaces with a database.
03.07	Create simple interfaces for data conversion between sources and systems.
03.08	Design and develop interface between ERP modules and systems.
03.09	Develop simple programs and cloud applications using ERP development tools.
03.10	Create usable reports with writing tools and languages related to applicable ERP systems.
03.11	Identify different operating system architectures.
03.12	Identify networking protocols' benefits and limitations.
03.13	Implement modifications to programs and systems to address security for mobile systems and data sharing including end point protection and site based security.
03.14	Develop basic site-based and end point security policies.

	03.15 Exhibit proficiency in the concepts of distributed applications and hosting web applications or utilizing cloud resources.
04.0	Demonstrate proficiency in Enterprise Resource Planning (ERP) project planning. – The student will be able to:
	04.01 Describe project planning fundamentals and concepts including feasibility studies.
	04.02 Identify project stakeholders.
	04.03 Determine stakeholder needs.
	04.04 Determine stakeholder training requirements.
	04.05 Identify potential stakeholder conflicts of interest.
	04.06 Define the scope of a project.
	04.07 Create project timelines.
	04.08 Establish rules of communication between project stakeholders.
	04.09 Create approval plans.
	04.10 Create conflict resolution plans.
	04.11 Define and sequence tasks.
	04.12 Identify technology-related risks.
	04.13 Establish project hardware and software dependencies.
	04.14 Identify and assign project resources and materials (e.g., Vendor RFPs).
	04.15 Budget resources.
	04.16 Identify training needs.
	04.17 Document project plan.
	04.18 Construct an implementation schedule for a large project.
05.0	Demonstrate proficiency in Enterprise Resource Planning (ERP) project coordination. – The student will be able to:
	05.01 Use workflow software tools including scheduling, budgeting and project management.
	05.02 Identify and manage project resources.
	05.03 Identify and manage project risks.

	05.04 Collaborate with team members.
	05.05 Facilitate project changes.
	05.06 Participate in project implementation activities.
	05.07 Perform a detailed project SWOT (Strengths Weakness Opportunities Threats) analysis.
	05.08 Describe the scale and impact of the project on the organization.
	05.09 Identify how business process integration will change the relationships between traditional functional departments within the organization.
	05.10 Describe any role re-definement by function within the organization.
	05.11 Describe the cost and time parameters of the project an implementation schedule for a large project.
06.0	Demonstrate proficiency in developing Enterprise Resource Planning (ERP) customers' business function requirements. – The student will be able to:
	06.01 Identify, document, and compile stakeholder requirement.
	06.02 Define the scope, objectives, and parameters of the project.
	06.03 Interview users and analyze their workflow systems and procedures.
	06.04 Identify integration points by department and process.
	06.05 Describe the function and supporting activities for Joint Application Development (JAD) meeting.
	06.06 Describe the overall impact the project will have on the organization.
	06.07 Assist in identifying potential problem areas.
	06.08 Assist with user training.
	06.09 Identify solutions and methods to fulfill requirements.
07.0	Demonstrate competence in communications with Enterprise Resource Planning (ERP) customers. – The student will be able to:
	07.01 Summarize and document project overview.
	07.02 Create ERP design modules.
	07.03 Write program test scripts.
	07.04 Present design models.
	07.05 Coordinate activities and resources with all relevant departments.

07.06	Use current technologies to provide in person and virtual to schedule meetings.
07.07	Create progress reports.
07.08	Use presentation technology to provide in person and virtual presentation.
07.09	Use presentation technology to provide in person and virtual training.
07.10	Deliver and explain procedure to stakeholders.
07.11	Act as a training intermediary for stakeholders.
07.12	Identify and define long-term implications of system changes.
07.13	Explain the difference between outsourcing and in-house support.
07.14	Apply effective customer relations.
07.15	Use current technologies to provide in person and virtual communications to keep the customer informed.
07.16	Demonstrate proper follow-up techniques.
08.0	Demonstrate proficiency in business and management processes. – The student will be able to:
08.01	Define the three types of organizations, government, for profit and not for profit.
08.02	Describe basic functions within the typical business organization.
08.03	Describe various forms of management hierarchies and organizational design.
08.04	Identify the responsibilities and duties of managers by level or function within the organization.
08.05	Contrast the operations and organizational forms of small, medium and large organizations.
08.06	Describe the role and impact of Information Technology in modern business management.
08.07	Explain the interrelationships between business processes including marketing, production, finance, human resources.
08.08	Identify software packages that support the business processes used by large enterprises.
08.09	Describe the general accounting process.
08.10	Interpret and use financial reports, budgets, and basic financial analysis techniques.
08.11	Use productivity software to create spreadsheets, documents, reports, schedules, databases, and Internet communication.
08.12	Describe the importance of the role of human capital in modern business management.

	08.13 Describe the functions of human resource management.
	08.14 List the basic components of business contracts.
	08.15 Identify ROI (Return on Investment).
09.0	Demonstrate proficiency with high-level computer programming languages as related to Enterprise Resource Planning (ERP) software. – The student will be able to:
	09.01 Describe the appropriate programming languages applicable to ERP software and how they differ.
	09.02 Apply structured programming for a high-level program as related to ERP software.
	09.03 Write a program in a high-level language as related to ERP software.
	09.04 Identify and define associated system level concepts.
	09.05 Describe how enterprise computing is used to support ERP.
10.0	Perform general organizational computing workplace competencies. – The student will be able to:
	10.01 Follow oral and written instructions.
	10.02 Prepare, outline, and deliver a short oral presentation.
	10.03 Prepare visual material to support an oral presentation.
	10.04 Interpret appropriate information from graphics, maps, or signs.
	10.05 Participate in group discussions as a member and as a leader.
	10.06 Apply effective time-management skills.
	10.07 Demonstrate self-motivation and responsibility to complete an assigned task.
	10.08 Identify legal and ethical issues within privacy, legal liability and security.
	10.09 Apply principles and techniques for being a productive, contributing member of a team.
	10.10 Identify and use acceptable strategies for resolving conflict in the workplace.
	10.11 Identify techniques for stress management and prevention of job burnout.
11.0	Demonstrate employability skills. – The student will be able to:
	11.01 Describe different job search methods, including online and traditional.
	11.02 Conduct a job search.

	11.03 Identify documents, which may be required when applying for a job interview.
	11.04 Complete a job application form correctly.
	11.05 Demonstrate competence in job interview techniques.
	11.06 Identify acceptable work habits.
	11.07 Demonstrate knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes Chapter 442.
12.0	Demonstrate effective communication skills. – The student will be able to:
	12.01 Create documents or online tools commonly used in business and industry (e.g., RFP, GANTT chart, MS Project).
	12.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	12.03 Demonstrate appropriate business etiquette skills.
13.0	Demonstrate professional development skills. – The student will be able to:
	13.01 Identify corporate strategies and policies.
	13.02 Build mentor relationships.
	13.03 Identify industry trends and developments.
	13.04 Continue formal education.
	13.05 Network with industry professionals.
	13.06 Read industry journals and magazines.
	13.07 Attend seminars, workshops, and tradeshows.
	13.08 Obtain industry and field certifications as required for career advancement.

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)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: **Game Development Design**
Career Cluster: **Information Technology**

AS	
CIP Number	1550041100
Program Type	College Credit
Standard Length	60 credit hours
CTSO	PBL
SOC Codes (all applicable)	15-1131 – Computer Programmers 15-1132 -- Software Developers, Applications 15-1199 – Computer Occupations, All Others

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 evaluate their potential as animators and game designers. Coursework covers all aspects of animation, character design, motion capture, production & editing, and various multi-media skills needed for success.

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.

The content includes but is not limited to rendering three-dimensional forms into two-dimensional drawings, digital art and design, narrative storytelling, storyboarding, basic computer animation skills, 3D animation modeling, rendering and character animation, character design, development, rigging and animation, motion graphics, designing and implementing computer animation projects, and producing a 3D animated short film, 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 60 credit hours.

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 Develop 3D programs.
11.0 Demonstrate an understanding of network programming for game development.
12.0 Embed artificial intelligence (AI) methods and algorithms to create and modify games.
13.0 Evaluate artificial intelligence (AI) Path Planning.
14.0 Apply principles of stimulus-response agents.
15.0 Utilize agent architectures.
16.0 Create decision making systems.
17.0 Create and modify game tree systems.
18.0 Apply neural networks.
19.0 Utilize genetic algorithms.
20.0 Create virtual reality environments.
21.0 Create a complete working animated game or film.

Florida Department of Education
Student Performance Standards

Program Title: **Game Development Design**
CIP Number: **1550041100**
Program Length: **60 Credit Hours**
SOC Code(s): **15-1131, 15-1132 and 15-1199**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. 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.
	02.03 Study automation software for game and software 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: mouse's, 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	Develop 3D programs. – The student will be able to:
10.01	Use popular existing 3D libraries to draw, move, rotate, scale, and render 2D and 3D graphics.
10.02	Create 3D data files for storing simple 3D objects.
10.03	Discuss articles about techniques and methods of programming 3D graphics.
10.04	Create a design document for their final project using 3D graphics.
10.05	Create programs that will read in 3D items from data files and display the items in 3D on the screen.
10.06	Create their own 3D items to display in the program they write.
10.07	Convert real coordinates to virtual and screen coordinates.
10.08	Discuss different notation for 3D coordinate systems in games.
10.09	Create a 3D world with multiple 3D items and moving cameras.
10.10	Scale and skew all the 3D items in the 3D virtual world relative to their location to the camera to create realism.
10.11	Apply hidden surface removal algorithms.

10.12	Develop the 3D rendering pipeline.
10.13	Summarize articles about new and current 3D rendering hardware on the market.
10.14	Distinguish 3D rendering software and hardware available for developing games.
10.15	Modify programs that do texture mapping.
10.16	Develop 3D texture mapped objects.
10.17	Apply their own texture maps to objects they create.
10.18	Use texture mapping in the final project a 3D game.
10.19	Extract 3D objects in from a file.
10.20	Create 3D objects in a file.
10.21	Use C++ structures to store 3D objects in memory.
10.22	Use C++ classes to store 3D objects in memory.
10.23	Use data files and classes/structures to store 3D objects in the final project.
10.24	Create 3D objects that have curved surfaces and adding them to their 3D world of objects.
10.25	Discuss papers on different ways to program curved surfaces.
10.26	Use curved surfaces in the final project.
10.27	Create a design document for a 3D game that they are going to develop.
10.28	Create a 3D game that uses multiple 3D objects and textures.
10.29	Modify and writing programming that uses matrices multiplication for moving rotating, scaling objects in 3D.
10.30	Use matrix multiplication for converting from the real coordinate system to screen coordinates.
11.0	Demonstrate an understanding of network programming for game development. – The student will be able to:
11.01	Summarize research papers on multi-player game development, client/server and peer-to-peer networking.
11.02	Explain the future of networking and multi-player game development.
11.03	Create a presentation on a game networking topic for the class.

11.04	Modify existing programs that use different protocols to communicate between computers.
11.05	Use existing network programming libraries for creating a network messaging program.
11.06	Create simple games that use the TCP and IPX protocols to communicate between computers.
11.07	Distinguish different types of ISP provider connections.
11.08	Examine the limitations of game development for certain types of ISP connections.
11.09	Distinguish all of the layers of the OSI Model in terms of what is the function of each layer and how they work together.
11.10	Summarize each of the layers of the OSI model.
11.11	Relate the application layer and game development.
11.12	Modify existing programs that use the application layer.
11.13	Diagram the application layer of the OSI model.
11.14	Modify existing programs that use peer-to-peer application programming.
11.15	Write peer-to-peer based programs and games.
11.16	Modify existing programs that use the client server model for network application.
11.17	Install the DirectX Standard Development Kit (SDK) and its programming libraries.
11.18	Modify existing programs that uses the DirectX's DirectPlay for network and game applications. Writing small games that use DirectX's DirectPlay to communicate over the network for their final project.
11.19	Identify lobby based games and application.
11.20	Explain code for lobby initialization and startup.
11.21	Retrieve connection information for lobby based games and applications.
11.22	Modify existing program that uses the sockets for application communication.
11.23	Write sockets base programs for game communication.
11.24	Use built in C++ libraries for creating a simple network based game.
11.25	Examine new network technologies for game development.

	11.26 Summarize articles by giving a class presentation on future of networking and game development.
12.0	Embed artificial intelligence (AI) methods and algorithms to create and modify games. – The student will be able to:
	12.01 Examine the origins of artificial intelligence for games, and the first games to use artificial intelligence.
	12.02 Analyze how AI is used in games.
	12.03 Distinguish the different methods used to create AI for games.
	12.04 Modify existing AI methods for games.
	12.05 Create new AI methods games.
	12.06 Discuss at what level of programming AI starts.
13.0	Evaluate artificial intelligence (AI) Path Planning. – The student will be able to:
	13.01 Research path planning.
	13.02 Discuss the advantages and disadvantages of path planning.
	13.03 Modify existing path planning code to change the behavior of the game's computer controlled characters.
	13.04 Enhance existing games by creating computer controlled characters.
14.0	Apply principles of stimulus-response agents. – The student will be able to:
	14.01 Modify code for different stimulus-response agent.
	14.02 Create computer controlled characters using stimulus-response agents.
	14.03 Combine aspects of stimulus-response agents systems with other artificial intelligence methods to create new systems for computer controlled characters.
	14.04 Modify code for different stimulus-response agents.
	14.05 Create computer controlled characters using stimulus-response agents.
	14.06 Combine aspects of stimulus-response agents systems with other artificial intelligence methods to create new systems for computer controlled characters.
15.0	Utilize agent architectures. – The student will be able to:
	15.01 Modify code for different agent architectures.

	15.02 Create computer controlled characters using agent architectures.
	15.03 Combine aspects of agent architectures systems with other AI methods to create new systems for computer controlled characters.
16.0	Create decision making systems. – The student will be able to:
	16.01 Modify code for different decision making systems.
	16.02 Create computer controlled characters using decision making systems.
	16.03 Combine aspects of decision-making systems with other AI methods to create new systems for computer controlled characters.
17.0	Create and modify game tree systems. – The student will be able to:
18.0	Apply neural networks. – The student will be able to:
	18.01 Modify code for artificial neural networks (ANNs).
	18.02 Create computer controlled characters using ANNs.
	18.03 Combine aspects of neural networks systems with other AI methods to create new systems for computer controlled characters.
19.0	Utilize genetic algorithms. – The student will be able to:
	19.01 Modify code for genetic algorithms systems.
	19.02 Create computer controlled characters using genetic algorithms.
	19.03 Combine aspects of genetic algorithms systems with other AI methods to create new systems for computer controlled characters.
20.0	Create virtual reality environments. – The student will be able to:
	20.01 Modify programs that use different graphics libraries.
	20.02 Use different graphics libraries in the final project and programming assignments.
	20.03 Develop libraries to use with 3D software development.
	20.04 Modify existing programs that use sound and music to add realism in game development.
	20.05 Modify sound systems to add direction and distance to sound effects.
	20.06 Use sound effects in programming assignments.
	20.07 Distinguish different sound file formats with respects to quality, and size.

20.08	Use sound effects and music in the final project.
20.09	Modify existing programs that use different types of input devices in game development.
20.10	Use different input devices in the final project and programming assignments.
20.11	Use forced feedback devices for input.
20.12	Summarize papers on the future of input devices.
20.13	Create 3D transparent objects.
20.14	Summarize papers on alpha blending programming methods.
20.15	Use transparency or fog in the final project.
20.16	Distinguish partial systems in terms of their uses such as fire and explosions.
20.17	Modify and write programs that use partial systems for special effects.
20.18	Apply physics to particle systems for realism.
20.19	Distinguish different methods for creating shadows.
20.20	Experiment with different lighting effects.
20.21	Modify 3D programs to include lighting and shadow effects in a 3D world.
20.22	Apply light and shadow effects in games to add realism.
20.23	Create light sources and shadows in the final project.
20.24	Modify existing programs that use reflection and refraction.
20.25	Develop programs that use light reflection and refraction.
20.26	Use light reflection and refraction in the final project.
20.27	Modify programs that use texture mapping.
20.28	Create 3D texture-mapped surfaces.
20.29	Use texture mapping in the final project.
20.30	Modify programs that use collision detection and reaction.

	20.31 Compare different collision detection algorithms in terms of CPU usage and accuracy.
	20.32 Use collision detection in the final project.
	20.33 Discuss advantages of different collision methods.
	20.34 Modify programs that use visible-surface determination.
	20.35 Apply different algorithms for visible-surface determination to determine their effect on the performance of games and the game engines.
	20.36 Modify programs that use hidden line removal.
	20.37 Apply different algorithms for hidden line removal to determine their effects on the performance on games and the game engines.
	20.38 Apply basic physics to a 3D game environment.
	20.39 Create simplified calculations to mimic real life physics.
	20.40 Manipulate physics functions to be applied to existing data structures that store the 3D world.
21.0	Create a complete working animated game or film. – The student will be able to:
	21.01 Distinguish game development projects.
	21.02 Discuss case studies on game development projects.
	21.03 Evaluate different types of projects in game development.
	21.04 Create a game proposal document for a game development project.
	21.05 Present and justifying the final completed project to the class.
	21.06 Distinguish different team structures used in game development.
	21.07 Work on a team project to develop a game from start to finish.
	21.08 Discuss case studies on team game development structures.
	21.09 Develop a game in teams from start to finish.
	21.10 Subdivide a game development project into parts.
	21.11 Research different game development processes.
	21.12 Apply one of the existing processes to develop a game from start to finish.

21.13	Justify the game development process that was chosen for the project.
21.14	Distinguish the stages of game development.
21.15	Develop a game from start to end and working through all the stages of game development.
21.16	Create a fully working game using all the skills gained in the game programming courses.
21.17	Use all aspects of game programming development including graphics, sound, networking, software analysis, level building and design.
21.18	Create a timeline, and meeting deadlines on their project.
21.19	Use professional scheduling tools to communicate with the project team.
21.20	Prepare progress reports.
21.21	Use existing code from previous projects and publicly available code.
21.22	Give credits or request permission to use codes.

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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Florida Department of Education
Curriculum Framework

Program Title: **E-Business Technology**
Career Cluster: **Information Technology**

AS	
CIP Number	1552120107
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Others

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 E-Business such as computer specialists, database technicians, security specialists, web content specialists, developers, technical, systems, and network analysts, web security specialists, and Internet technical support specialists 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 a balance of business and technology components and allows the student to gain additional skills in one of four areas of specialization: Business, Technology, Software, and Security.

Program Structure

This program is a planned sequence of instruction consisting of 60 credit hours.

Standards

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

01.0 Demonstrate comprehension and communication skills.
02.0 Demonstrate professional development skills.
03.0 Perform documentation and technical reference activities.
04.0 Demonstrate employment skills.
05.0 Perform general organizational workplace competencies.
06.0 Demonstrate knowledge of legal and ethical issues.
07.0 Perform project management activities.
08.0 Understand issues related to e-Business.
09.0 Understand local area networks.
10.0 Demonstrate proficiency in microcomputer operating systems and software.
11.0 Perform web authoring activities.
12.0 Conduct systems analysis and design.
13.0 Understand database management systems.
14.0 Compare and contrast e-Business with traditional business.
15.0 Identify, classify and demonstrate management activities for e-Business.
16.0 Identify legal and ethical issues for e-Business.
17.0 Accounting and finance activities.
18.0 Perform marketing activities for e-Business.

In addition to the above core outcomes, the student will successfully complete the outcomes in at least one of the following specializations:

Security Specialization

19.0 Design, develop and implement physical, network, host, application, and user security systems for e-Business.
20.0 Maintain and monitor security policies.

Software Specialization

19.0 Use various programming software applications, languages and protocols for e-Business environment.
20.0 Develop software applications for e-Business environment.

Technology Specialization

19.0 Perform web Server Management activities.
20.0 Support e-Business applications and product development.
21.0 Maintain network infrastructure.

22.0 Design, integrate and deploy e-Business systems.
23.0 Perform technical requirements to support UNIX operating system.
24.0 Maintain systems quality and perform testing activities.

Business Specialization

19.0 Perform management activities to support human resources in e-Business environment.
20.0 Perform activities to enhance supply chain management in e-Business.
21.0 Use various models and strategies for e-Business.
22.0 Perform customer service techniques for e-Business.
23.0 Perform selling techniques for e-Business.

Florida Department of Education
Student Performance Standards

Program Title: **E-Business Technology**
CIP Number: **1552120100**
Program Length: **60 credit hours**
SOC Code(s): **15-1199**

Refer to Rule 6A-14.030 (4) F.A.C., for the minimum amount of general education coursework required in the Associate of Science (AS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate comprehension and communication skills. – The student will be able to:
01.01	Read and discuss work from different professional journals related to the course content.
01.02	Use reference sources such as books, magazines, and electronic databases to gather and critically evaluate materials.
01.03	Prepare, outline and deliver an oral report with appropriate materials.
01.04	Participate in group discussions as a member and as a leader.
01.05	Follow written and oral technical instructions.
01.06	Read and understand graphs, charts, diagrams and tables commonly used in this industry/occupation.
02.0	Demonstrate professional development skills. – The student will be able to:
02.01	Identify corporate strategies and policies.
02.02	Maintain professional contact for future projects.
02.03	Facilitate mentor relationships.
02.04	Network with local professionals in the industry.
02.05	Understand the importance of attending seminars, workshops, and tradeshows.
03.0	Perform documentation and technical reference activities. – The student will be able to:
03.01	Use technical vocabulary appropriately.
03.02	Locate information in technical references.
03.03	Prepare technical reports.

	03.04 Describe appropriate documentation procedures and practices.
	03.05 Produce and maintain system documentation.
	03.06 Perform documentation and technical reference activities.
	03.07 Cite correctly Internet-based resources using proper format.
	03.08 Research industry trends on the Internet.
04.0	Demonstrate employment skills. – The student will be able to:
	04.01 Identify appropriate attire and grooming for a business office.
	04.02 Conduct a job search.
	04.03 Demonstrate job interview skills.
	04.04 Identify methods for securing an employment references.
	04.05 Identify and discuss issues contained within professional codes of conduct.
	04.06 Use appropriate communication skills, courtesy, manners, and dress in the workplace.
	04.07 Identify acceptable work habits.
	04.08 Identify and use acceptable strategies for resolving conflict in the workplace.
	04.09 Identify and demonstrate appropriate responses to criticism from employers, supervisor, or other employees.
	04.10 Apply principles and techniques for working productively with people of diverse cultures and backgrounds.
	04.11 Identify techniques for stress management and prevention of job burn-out.
	04.12 Use appropriate communication skills, telephone etiquette, courtesy, and manners when dealing with customers.
	04.13 Demonstrate knowledge of how to make appropriate job changes.
05.0	Perform general organizational workplace competencies. – The student will be able to:
	05.01 Follow oral and written instructions.
	05.02 Prepare, outline, and deliver a short oral presentation.
	05.03 Participate in group discussion as a member and as a leader.

05.04	Prepare visual material to support an oral presentation.
05.05	List the steps in problem solving.
05.06	Choose appropriate action in situations requiring effective time management.
05.07	Apply principles and techniques for being a productive, contributing member of a team.
05.08	Communicate effectively with individuals lacking a technical background.
05.09	Identify clear detailed technical oral instructions.
05.10	Identify examples of effective strategies to fulfill end user needs training strategies and techniques.
05.11	Identify strategies to build mutual trust, respect, and cooperation among team members.
05.12	Apply techniques for organizing and planning of time and resources to complete an assigned task.
05.13	Apply active listening techniques in interpersonal communications.
05.14	Identify strategies to improve and maximize productivity in the workplace.
05.15	Brainstorm techniques such as brainstorming to generate ideas and suggestions to achieve a task.
05.16	Analyze alternatives and compare costs and benefits in determining the best solution.
06.0	Demonstrate knowledge of legal and ethical issues. – The student will be able to:
06.01	Correctly cite or attribute sources.
06.02	Use copyrighted materials appropriately.
06.03	Identify the types of works that are protected by intellectual property laws.
06.04	Discuss the basic elements of a contract.
06.05	Explain laws regarding e-mail litigation, including anti-spam laws.
06.06	Discuss e-mail use and ownership.
06.07	Describe customer and employee privacy issues and safeguards.
06.08	Develop examples of acceptable use policies.
06.09	Compare organizational codes of ethics.
06.10	Research and write a personal code of ethics.

07.0	Perform project management activities. – The student will be able to:
	07.01 Describe the role of project management (PM) within the organization.
	07.02 Identify the strengths and weaknesses of various project life cycle designs.
	07.03 Demonstrate the importance of project scope management.
	07.04 Compare and contrast project selection methods.
	07.05 Build a Work Breakdown Structure (WBS), Gantt chart, and Pert Chart and describe those different elements.
	07.06 Compare and contrast types of cost estimates.
	07.07 Examine cost control and earned value analysis.
	07.08 Examine organizational planning, staff acquisition, and team development.
	07.09 Examine risk identification, quantification, response development, and response control.
	07.10 Compare and contrast project tracking and project reporting.
	07.11 Understand change control and configuration control.
	07.12 Understand subcontracting and outsourcing.
	07.13 Discuss and analyze project management case studies.
08.0	Understand issues related to e-Business. – The student will be able to:
	08.01 Explain the difference between intranet and the Internet and the role of each in e-Business.
	08.02 Explain the history, purpose and use of the World Wide Web and how it has enabled e-Business.
	08.03 Describe the rise of various e-Business models.
	08.04 Explain security issues related to electronic payment.
	08.05 Explain issues of advertising, marketing and solicitation activities affecting e-Business.
09.0	Understand local area networks. – The student will be able to:
	09.01 Identify and explain the main purpose of various communication hardware devices, communication media, and protocols.
	09.02 Describe various network topologies.

09.03	Differentiate between the OSI reference model and the TCP/IP protocol architecture.
09.04	Differentiate between analog and digital signals.
09.05	Describe various transmission media and how devices such as modems work.
09.06	Explain collision occurrences and detection.
09.07	Explain the factors and techniques for data transportation.
10.0	Demonstrate proficiency in microcomputer operating systems and software. – The student will be able to:
10.01	Describe the historical development of computer operating software.
10.02	Describe the major hardware and related software of microcomputers.
10.03	Describe the various operating systems.
10.04	Explain system and application architectures.
10.05	Describe various media and file formats.
10.06	Use various software applications, including word processors, spreadsheets, databases, presentation software, and appointment scheduling applications.
10.07	Identify the major programming languages used in business data processing.
11.0	Perform web authoring activities to support e-Business. – The student will be able to:
11.01	Identify and describe the components of an HTML document.
11.02	Create lists in an HTML document.
11.03	Recognize the various layouts used in website design.
11.04	Use storyboarding to design a comprehensive website.
11.05	Create links between HTML documents within a website and to external HTML documents.
11.06	Create tables.
11.07	Add images to webpages.
11.08	Use CSS to customize webpage styles.
11.09	Create image maps.

	11.10 Identify elements of HTML fill-in forms.
	11.11 Describe the various CGI scripting languages used in a website.
	11.12 Identify and use client side programming technologies.
12.0	Conduct systems analysis and design. – The student will be able to:
	12.01 Perform a detailed systems investigation and analysis of the project.
	12.02 Design the input and output for the system.
	12.03 Design the data files for the systems.
	12.04 Design the processing flow of the system.
	12.05 Design a system to insure that only valid data is accepted and processed, completely and accurately.
	12.06 Establish a project plan for the development and implementation of the systems.
	12.07 Program and test the system.
	12.08 Develop the final systems documentation.
	12.09 Conduct necessary training and file conversion to properly implement the system.
	12.10 Understand industry-standard models for developing and maintaining software.
	12.11 Be able to use industry-standard project tools.
13.0	Understand database management systems. – The student will be able to:
	13.01 Understand the role of databases and how databases influence e-Business decisions.
	13.02 List the advantages and disadvantages of using databases.
	13.03 Understand the importance of data modeling as an analysis and communication tool.
	13.04 Describe the elements of a data model.
	13.05 Model the data requirements for sample e-Business problems.
	13.06 Understand the principles associated with the relational model.
	13.07 Understand the relationship between functional dependencies and keys.

13.08	Determine the Normal form of a relation and execute the steps necessary to put the relation into the proper normal form.
13.09	Define and contrast logical and physical keys.
13.10	Understand the advantages and disadvantages of indexes.
13.11	Understand the basic operators of relational algebra as a basis for retrieving data from relational databases.
13.12	Create and use Structured Query Language (SQL) to retrieve data from a database.
14.0	Compare and contrast e-Business with traditional business models. – The student will be able to:
14.01	Define and describe the evolution of e-Business.
14.02	Describe how business operations have changed due to e-Business.
14.03	Explain the basic business models of electronic marketing.
14.04	Identify critical success factors for electronic marketing.
14.05	Explain the impact of the Internet on customers and markets for businesses.
14.06	Describe consumer buying behavior and organizational buying behavior.
14.07	Explain how service industries conduct business electronically.
14.08	Describe several innovative applications in the service sector.
14.09	Identify the various payment options in e-commerce.
14.10	Explain the strategic planning issues for e-Business.
14.11	Identify the critical success factors of an e-Business project/venture.
14.12	Describe the major components and impact of web-based economics.
15.0	Identify, classify and demonstrate management activities for e-Business. – The student will be able to:
15.01	Define the role of the entrepreneur in global business.
15.02	Describe the entrepreneurial profile.
15.03	Discuss the role of the internet in helping small business expand their market.
15.04	Explain the importance of strategic management to business.

15.05	Describe the components of a marketing plan and explain the benefits of preparing one.
15.06	Describe how to prepare financial statements and use them to manage the business.
15.07	Describe effective pricing strategies.
15.08	Discuss the links among pricing, image, and competition.
15.09	Explain what seed capital is and why it is so important to the entrepreneurial process.
15.10	Explain the difference in the three types of capital that small businesses require: Fixed, Working and Growth.
15.11	Explain the stages in the location decision.
15.12	Describe the location criteria and outline the basic location options for retail and service business.
15.13	Explain purchasing, quality control, vender analysis and managing inventory while using technology to gain a competitive edge.
15.14	Explain the challenges involved in the entrepreneur's role as leader and what it takes to be a successful leader.
15.15	Learn management succession and risk management strategies in family business together with ethics and social responsibility.
15.16	Describe, explain and discuss business's responsibility to employees, customers, investors and the community.
15.17	Describe management's historical role in business operations.
15.18	Compare and contrast different management philosophies.
15.19	Compare and contrast the employees' personal needs with those of the organization.
15.20	Describe methods managers can use to deal with management politics.
15.21	Describe the nature of management's legal environment for traditional and electronic environments.
15.22	Describe the planning process of managers.
15.23	Discuss the characteristics and functions of an organization chart.
15.24	Describe the act and benefits of delegation.
15.25	Summarize the components of job descriptions and specifications.
15.26	Define and describe the activities involved in making a job analysis.
15.27	Discuss potential problems in evaluating employees and methods to avoid problems.

15.28	Discuss strategies managers may use to build and sustain high morale and motivation.
15.29	Describe methods of direct and indirect compensation.
15.30	Describe various employee relations practices.
15.31	Summarize strategies to improve personal and organizational communication.
15.32	Discuss the role of information systems in the control system.
15.33	Discuss the steps in the basic decision making process.
15.34	Describe several factors that influence decision-making.
15.35	Distinguish among management functions.
15.36	Demonstrate knowledge of the relationship between authority and responsibility to task accomplishment.
15.37	Select the most effective communication systems.
15.38	Identify problems and make an appropriate decision.
16.0	Identify legal and ethical issues for e-Business. – The student will be able to:
16.01	Describe the procedure to obtaining protection under intellectual property law.
16.02	Describe and recognize material that is defamatory.
16.03	Explain the right of publicity and the right of privacy.
16.04	Explain copyright assignment and the Visual Artists Rights Act.
16.05	Discuss licensing and registration issues.
16.06	Describe the importance in choosing a strong trademark.
16.07	Understand basic laws that apply to e-commerce.
16.08	Discuss the permission required for linking, revenue-sharing agreements, and liability issues pertaining to linking.
16.09	Explain other liability issues for ISPs.
16.10	Differentiate trademark protection and trade secret protection.

17.0	Accounting and finance activities. – The student will be able to:
17.01	Identify and understand accounting and financial concepts.
17.02	Describe and use financial analysis tools.
17.03	Perform standard accounting and bookkeeping functions.
17.04	Understand the impact and implications of federal auditing guidelines.
18.0	Perform marketing activities for e-Business. – The student will be able to:
18.01	Discuss what marketing is and why it is important to organizations and individuals.
18.02	Describe the key decisions in the development of corporate strategy.
18.03	Recognize the outcomes of consumers' decisions to purchase or not to purchase and how these affect marketing success.
18.04	Define and explain market segmentation, target markets, and product differentiation and positioning.
18.05	Describe the issues involved in product and brand positioning.
18.06	Differentiate between consumer and business products.
18.07	Describe the way marketing research is used in the new-product development process.
18.08	Identify many of the influences on marketers' pricing decisions.
18.09	Explain how consumers form perceptions of quality and value.
18.10	Explain the functions and key activities of marketing channels.
18.11	Distinguish between direct and indirect marketing channels.
18.12	Explain the key elements of the marketing communications process.
18.13	Describe the key activities in sales management.
18.14	Explain the difference between e-Business, e-commerce, and e-marketing.

Security Specialization	
19.0	Design, develop and implement physical, network, host, application and user security systems for e-Business. – The student will be able to:
	19.01 Explain use and purpose of security policies.
	19.02 Conduct a security audit.
	19.03 Control access to systems, resources and data.
	19.04 Explain and manage system security in common operating systems.
	19.05 Describe concepts of web servers and their role in the network.
	19.06 Design, implement and maintain a web server.
	19.07 Explain how documents and files are stored on a web server.
	19.08 Describe different methods for projecting future traffic on a web server.
	19.09 Identify the necessary steps to ensure reliability and response of the server.
	19.10 Describe and implement the process for effectively organizing a website.
	19.11 Implement search engine optimization techniques.
	19.12 Set up the web server so that dynamic content can be provided to users of the website.
	19.13 Analyze server log files to determine trends in web server utilization.
	19.14 Identify vulnerabilities in Internet protocols and counter-measures for securing them.
	19.15 Properly configure and describe the operation of naming and directory services.
	19.16 Describe the operation of authentication and auditing services protocols and how to effectively secure them.
	19.17 Describe the operation of administrative services protocols and how to effectively secure them.
	19.18 Describe the operation of the IP Security protocol.
20.0	Maintain and monitor security policies. – The student will be able to:
	20.01 Identify basic network security.
	20.02 Describe purpose and use of packet sniffing, firewalls and proxies.

20.03 Define web server security.
20.04 Protect against the risks of directory browsing.
20.05 Assess client security issues.
20.06 Install and configure network security tools.
20.07 Describe authentication and identification schemes.
20.08 Define secure software.
20.09 Describe the use and purpose of encryption.
20.10 Define the advantages of Secure Socket Layer (SSL).
20.11 Define certificate authority.
20.12 Identify basic aspects of intrusion detection and steps to protect the web server from these threats.
20.13 Describe cryptographic attack models.
20.14 Describe the secret key and public key encryption methodology.
20.15 Use hashing techniques.
20.16 Use digital signatures in a network environment.
20.17 Use authentication processes in heterogeneous environments.
20.18 Create secure environment through defensive programming.
20.19 Explain the basic elements of Security Testing and Auditing.
20.20 Describe the capabilities of effective signature filter techniques.
20.21 Explain the importance of architectural design detection of intrusions.
20.22 Define and utilize various network based Intrusion Detection Solutions (IDS).
20.23 Explain intrusion detection and denial of service.
20.24 Issue and manage digital certificates.

Software Specialization
19.0 Use various programming software applications, languages and protocols for e-Business environment. – The student will be able to:
19.01 Describe Internet Protocols.
19.02 Explain how applets differ from applications in terms of program form, operating context, and how they are started.
19.03 Describe and use single- and multi-dimensional arrays.
19.04 Create classes that use inheritance aspects of the object-oriented paradigm.
19.05 Describe the error handling constructs.
19.06 Write a program that reads and writes text files.
19.07 Understand the hierarchy of classes designed for aggregate data.
19.08 Identify deprecated classes, and explain how to migrate.
19.09 Explain and use event handling in a GUI.
19.10 Differentiate between client-side scripting and server-side scripting.
19.11 Manipulate the objects contained in the Document Object Model (DOM).
19.12 Use variables, constants, and arithmetic operators to create valid arithmetic expressions.
19.13 Dynamically alter the sequence of code execution.
19.14 Use built-in functions as well as create custom functions, subroutines, and procedures within software using scripting languages.
19.15 Create server pages using languages.
19.16 Write programs in a language that implement network connection objects.
19.17 Create and use server-side include files.
19.18 Understand appropriate use of and demonstrate ability to incorporate and utilize cookies in e-Business software.
19.19 Integrate standard object model components with server pages.
19.20 Create webpage using data from a database.
19.21 Implement programs that use local or remote databases with standard protocols.

19.22	Use a scripting language on the server side of a distributed program.
19.23	Use a scripting language on the client side of a distributed program.
19.24	Implement levels of security in distributed software applications.
19.25	Read simple UML diagrams, and create UML documents that model programs.
19.26	Use built-in objects for error handling, file creation, and dictionary access in e-Business software.
19.27	Understand the use of client-side operating system tools.
19.28	Produce software that can interface with operating system services used to broadcast messages within a domain.
19.29	Utilize appropriate operating system interfaces to redirect output.
19.30	Describe various name space models.
19.31	Register and query a service.
19.32	Use transport service providers and name space service providers.
19.33	Explain and implement XML-related technologies.
19.34	Explain and use the different elements that make code easier to read.
19.35	Explain and use the different data types available in scripting languages.
19.36	Explain and use standard control structures such as repetition, selection, and sequence in the appropriate programming language.
19.37	Output data from scripting language.
19.38	Explain the benefits of using subroutines and libraries in code.
19.39	Debug code from scripting languages.
19.40	Explain basic Internet and server-side scripting security issues and common techniques to fix them.
19.41	Use a scripting language to create and manage form data submitted over the Internet.
19.42	Examine the use of shopping carts on the Internet and how scripting languages can be used in these applications.
19.43	Examine the use of auctions via the Internet and scripting languages.
19.44	Understand industry standard program design techniques.

19.45	Develop the logic for a program using both flowcharting and pseudo code.
19.46	Develop looping and nested looping logic.
19.47	Develop the logic of: three-level control break program, an extract program, an edit program, a file matching and an update program.
20.0	Develop software applications for e-Business environment. – The student will be able to:
20.01	Design software applications that are accessible by a variety of wireless and wired devices.
20.02	Explain alternatives to create dynamic content.
20.03	Integrate the push model of information delivery.
20.04	Use operating system services such as a personal web server for database development.
20.05	Explain server security and permissions.
20.06	Evaluate the advantages/disadvantages of different server platforms.
20.07	Explain scripting concepts and syntax.
20.08	Connect common databases using standard protocols.
20.09	Display data from a database using a web interface.
20.10	Write and modify a database record using a web interface.
20.11	Enable web security features.
20.12	Design and implement a basic shopping cart application.

Technology Specialization	
19.0	Perform web server management activities. – The student will be able to:
	19.01 Perform console management in the author and user mode.
	19.02 Create and navigate a custom management console.
	19.03 Create new user accounts.
	19.04 Implement groups into a domain.
	19.05 Change the domain mode.
	19.06 Manage software settings, scripts, and security settings.
	19.07 Manage administrative templates.
	19.08 Manage folder redirection.
	19.09 Configure and administer network printers.
20.0	Support e-Business applications and product development. – The student will be able to:
	20.01 Identify the different components to systems development life cycle and how they are interrelated.
	20.02 Identify deliverables for user project and build subprojects within lifecycle components.
	20.03 Create physical structure of web-based architecture.
	20.04 Create requirements for business request, develop web components necessary to satisfy request and test for acceptance.
	20.05 Use web browser and web authoring tools.
	20.06 Write required queries to get required answer sets.
21.0	Maintain network infrastructure. – The student will be able to:
	21.01 Identify web server hardware and discus performance evaluation.
	21.02 Describe security threat countermeasures, including anti-virus software and encryption.
	21.03 Identify basic components of electronic payment systems.
	21.04 Identify how to create and maintain an effective web presence and brand.

21.05	Describe various Electronic Data Interchange components.
21.06	Define and explain virtual communities and web portals.
21.07	Identify challenges of a global business regarding culture, legal and financial impacts, and differing languages.
21.08	Identify the planning stages of the e-Business project.
22.0	Design, integrate and deploy e-Business systems. – The student will be able to:
22.01	Describe the lifecycle of an e-Business.
22.02	Explain website information architecture design principles.
22.03	Identify e-Business systems development strategies.
22.04	Explain integration with LDAP, Messaging, and Collaboration.
22.05	Identify and describe the use of Meta Directories, Content Syndication, Single Sign-on, and Search Engines.
22.06	Identify deployment strategies and Middleware.
22.07	Identify Application Server Systems Architectures.
22.08	Explain Transaction Processing (TP) monitor systems architecture.
22.09	Identify integration solutions.
23.0	Perform technical requirements to support UNIX operating system. – The student will be able to:
23.01	Explain basic command syntax for approximately 100 common shell commands governing the file-system, printing and process control.
23.02	Identify and use the editors.
23.03	Schedule and reprioritize processes.
23.04	Use commands to get information and communicate with remote users.
23.05	Search for strings of text in files using shell meta-characters.
23.06	Use common tools to generate reports or filter text.
23.07	Use shell scripts to control flow, input, output and jobs.
23.08	Troubleshoot system problems.

24.0	Maintain systems quality and perform testing activities. – The student will be able to:
	24.01 Identify the advantages and disadvantages of client-server computing.
	24.02 Establish controls in a client-server framework.
	24.03 Explain software testing methodology.
	24.04 Describe the planning, executing and controlling of the testing process.
	24.05 Perform Graphical User Interface testing.
	24.06 Explain the server applications testing processes.
	24.07 Explain testing in a networked application environment.
	24.08 Incorporate cross-level functional testing within a data-driven framework-based environment.
	24.09 Use client-server testing metrics.
	24.10 Explain testing integration on the desktop.
	24.11 Explain testing for web-based client-server applications.
	24.12 Select and use appropriate automated test tools.

Business Specialization	
19.0	Perform management activities to support human resources in an e-Business environment. – The student will be able to:
19.01	Identify career choice in human resources.
19.02	Describe the components of the job requirement and analysis process.
19.03	Describe the important elements of effective human resource planning.
19.04	Discuss the performance appraisal and the uses of the performance appraisal.
19.05	Compare training options available to organizations.
19.06	Discuss strategies to improve organizational performance.
19.07	Describe various ways of compensating employees.
19.08	Summarize the legal regulations of compensation systems.
19.09	Explain the importance of retaining employees.
19.10	Discuss the importance of safety and health laws and standards.
19.11	Describe how to create a safe and healthy work environment.
19.12	Describe labor relations and collective bargaining.
20.0	Perform activities to enhance supply chain management. – The student will be able to:
20.01	Explain the electronic environment of the supply chain.
20.02	Explain the importance of information in an integrated supply chain.
20.03	Explain the technological applications for supply chain management.
20.04	Discuss how to engineer or reengineer the supply chain for optimal materials planning and handling.
20.05	Explain how relationships are important to the supply chain.
20.06	Explain the importance of suppliers in the supply chain.
20.07	Describe how to resolve conflicts in the supply chain.
20.08	Explain the laws and regulations regarding "order taking".
20.09	Describe the components involved in an international supply chain management system.

21.0	Use various models and strategies for e-Business. – The student will be able to:
	21.01 Explain the components, linkages, and evaluation of Business Models and their relationship with e-Business.
	21.02 Describe the competitive environment and how it can affect an Internet business.
	21.03 Describe the current strengths, weaknesses, opportunities, and threats to Internet business.
	21.04 Describe the limitations to transactions over the Internet.
	21.05 Describe the process of valuing and financing an Internet start-up.
	21.06 Describe macro environments and the impact on performance.
	21.07 Explain the differences between incumbents and new entrants.
22.0	Perform customer service techniques for e-Business. – The student will be able to:
	22.01 Define customer service.
	22.02 Discuss solutions to overcoming obstacles in customer service.
	22.03 Define service culture in organizations.
	22.04 Describe management's role in customer service formulation.
	22.05 Describe employee empowerment and its importance in providing good customer service.
	22.06 Explain the role of communicating in customer service.
	22.07 Determine strategies for working with various customer behaviors.
23.0	Perform selling techniques for e-Business. – The student will be able to:
	23.01 Describe the relationship of personal selling to market-driven economies.
	23.02 Identify career opportunities in the field of selling.
	23.03 Explain the importance of relationship skills in personal selling.
	23.04 Explain the importance of projecting a positive self-image.
	23.05 Discuss communication-style bias and how it influences the relationship process.
	23.06 Identify reasons why salespeople and customers benefit from thorough product knowledge.

23.07 List major sources of product information.
23.08 Discuss the evolving role of strategic selling.
23.09 Discuss the factors that influence people to make buying decisions.
23.10 Explain how to plan a sales presentation.
23.11 List criterion for qualifying and organizing prospects.
23.12 List guidelines for effective demonstrations.
23.13 Outline general strategies for negotiating buyer resistance.
23.14 Describe the proper attitude to display toward closing the sale.
23.15 List guidelines for closing the sale.
23.16 Explain how customer service can stimulate repeat business and referrals.
23.17 Describe how to properly handle activities that are part of the customer service program.
23.18 Describe the functions of a sales manager.
23.19 Explain how to manage time wisely.
23.20 List factors that influence the ethical conduct of sales personnel.
23.21 List and describe the functions of telemarketing.

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.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the appropriate career and technical student organizations for 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.

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.

Articulation

To be transferable statewide between institutions, this program must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific articulation agreements with each other.

The following industry certifications have been approved by the Florida State Board of Education for statewide articulation credit into this degree program.

Certified Internet Web (CIW) – E-Commerce Designer (PROSO003) – 3 credits
CompTIA Security+ (COMPT003) – 3 credits

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is 63 credit hours according to Rule 6A-14.030, F.A.C.

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:

E-Business Security Technical Certificate (0552120102) – 24 credit hours
E-Business Software Technical Certificate (0552120103) – 21 credit hours
E-Business Technical Certificate (0552120101) – 24 credit hours
E-Business Technology Technical Certificate (0552120104) – 21 credit hours
E-Business Ventures Technical Certificate (0552120105) – 24 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**

AS	
CIP Number	1552130101
Program Type	College Credit
Standard Length	60 credit hours
CTSO	Phi Beta Lambda, BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Others

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.

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: **1552130101**
Program Length: **60 credit hours**
SOC Code(s): **15-1199**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. 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.
01.01.1 Define the goals of the desired requirements.
01.01.2 Select an appropriate analysis strategy.
01.02 Describe the activities and goals of the design phase.
01.02.1 Determine appropriate reporting format.
01.02.2 Select appropriate reporting tool/form.
01.02.3 Describe appropriate delivery mechanism.
01.02.4 Define data criteria and constraints.
01.02.5 Delineate report data definitions.
01.03 Describe the activities and goals of the development phase.
01.03.1 Identify available data sources and formats.
01.03.2 Acquire data.
01.03.3 Analyze data.
01.03.4 Create report.
01.04 Describe the activities and goals of the evaluation phase.

	01.04.1	Define analytics/metrics suitable for evaluating accuracy and validity of results.
	01.04.2	Evaluate report output to assess whether intelligence is consistent with defined goals.
	01.04.3	Assess report performance and usability.
01.05	Describe the activities and goals of the deployment and maintenance phase.	
	01.05.1	Perform data reconciliation.
	01.05.2	Conduct periodic validation of reports with appropriate audiences and end-users.
	01.05.3	Track daily/weekly/monthly usage of data/reports.
	01.05.4	Determine proper “phasing out” thresholds for existing reports based on usage, data validity, and report reliability.
	01.05.5	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.	
	04.01.1	RDBMS.
	04.01.2	Data warehouse and OLAP Cubes.

04.01.3	Spreadsheet.
04.01.4	XML.
04.01.5	CSV.
04.01.6	Web service.
04.01.7	Raw Data and other (KML/Shape).
04.02	Define report data elements/requirements (metadata).
04.02.1	Dimensions.
04.02.2	Type I (As is – current).
04.02.3	Type II (Historical – slowly changing).
04.02.4	Facts.
04.02.5	Base.
04.02.6	Summaries.
04.02.7	Calculated fields.
04.02.8	Periodicity.
04.02.9	Relationships/JOINs.
04.03	Describe how data is to be used.
04.03.1	Data mining.
04.03.2	Filtering.
04.03.3	Exception threshold alerts.
04.03.4	Aggregating.
04.03.5	Snapshot.
04.03.6	Dynamic.
04.03.7	Historical/archive/disposal.
04.04	Determine the form of analysis.

	04.04.1	Comparative analysis.
	04.04.2	Impact analysis.
	04.04.3	Correlational (affinity) analysis.
	04.04.4	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.
		06.02.1 Size of recordset (scope & performance).
		06.02.2 Time/period (end points and span).
		06.02.3 Range (e.g., # of records).
		06.02.4 Data element (e.g., type, size).
		06.02.5 Localization (programming & display language).
	06.03	Describe how each of the following types of filters may be used to refine or enhance a report.

	06.03.1	Dimensions (Type I and Type II).
	06.03.2	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.	
	06.04.1	Display or action dependent on threshold.
	06.04.2	Triggers alert or advance warning of approaching static threshold.
	06.04.3	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.	
	06.05.1	GROUP BY.
	06.05.2	ORDER BY (SORT).
	06.05.3	Concatenation/substring.
	06.05.4	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.	
	07.01.1	Inventory repositories.
	07.01.2	Sales data.
	07.01.3	Customer data.
	07.01.4	Employee/staffing data.
	07.01.5	Financial data.
	07.01.6	Spatial data
	07.01.7	Security and Risk
07.02	Describe the risks and potential areas of concern related to the use of external data.	
	07.02.1	Integrity/validity of data.
	07.02.2	Legality of data availability.
	07.02.3	Privacy issues of data acquired.

		07.02.4 Confidentiality of acquisition.
	07.03	Describe potential issues, concerns, and obstacles associated with the use of data sources.
		07.03.1 Data form.
		07.03.2 Data integrity.
		07.03.3 Normalization.
		07.03.4 Cleaning.
	07.04	Describe the role and implications of standardization relative to internal and external data sources.
		07.04.1 Describe the need for data typing and transformation.
		07.04.2 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.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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

Career Certificate Program	
Program Number	B070320
CIP Number	0511020202
Grade Level	30, 31
Standard Length	1200 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1131 – Computer Programmers
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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. 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 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	SOC Code
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours	15-1151
B	CTS0041	Computer Programmer Assistant	BUS ED 1 @2 COMPU SCI 6 COMP PROG 7G	300 hours	15-1131
C	CTS0042	Junior Programmer		300 hours	15-1131
D	CTS0043	Junior Programmer II		300 hours	15-1131
E	CTS0044	Computer Programmer		150 hours	15-1131

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 14.0 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 systems to accomplish job objectives and enhance workplace performance.
02.0 Develop an awareness of microprocessors and digital computers.
03.0 Demonstrate an understanding of operating systems.
04.0 Use technology to enhance the effectiveness of communication skills utilizing word processing applications.
05.0 Use technology to enhance communication skills utilizing presentation applications.
06.0 Use technology to enhance the effectiveness of communication utilizing spreadsheet and database applications.
07.0 Use technology to enhance communication skills utilizing electronic mail.
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 Demonstrate competence in page design applicable to the WWW.
12.0 Develop an awareness of emerging technologies.
13.0 Develop awareness of computer languages and software applications.
14.0 Demonstrate comprehension and communication skills.
15.0 Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development.
16.0 Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types.
17.0 Distinguish between iterative and non-iterative program control structures.
18.0 Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted, and translated programming languages.
19.0 Describe the processes, methods, and conventions for software development and maintenance.
20.0 Explain the types, uses, and limitations of testing for ensuring quality control.
21.0 Create a program design document using Unified Modeling Language (UML) or other common design tool.
22.0 Describe information security risks, threats, and strategies associated with software development.
23.0 Design a computer program to meet specific physical, operational, and interaction criteria.
24.0 Create and document a computer program that uses a variety of internal and control structures for manipulating varied data types.
25.0 Create and document an interactive computer program that employs functions, subroutines, or methods to receive, validate, and process user input.
26.0 Create a unit test plan, implement the plan, and report the results of testing.
27.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
28.0 Solve problems using critical thinking skills, creativity and innovation.
29.0 Use information technology tools.
30.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
31.0 Describe the importance of professional ethics and legal responsibilities.

32.0 Participate in work-based learning experiences.
33.0 Identify functions of information processing.
34.0 Identify functions of computers.
35.0 Test programs.
36.0 Plan program design.
37.0 Code programs.
38.0 Perform program maintenance.
39.0 Evaluate assigned business computer programming tasks.
40.0 Develop an awareness of software quality assurance.
41.0 Implement enhanced program structures.
42.0 Develop an understanding of programming techniques and concepts.
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 Explain the importance of employability skill and entrepreneurship skills.
46.0 Test programs.
47.0 Plan program design.
48.0 Code programs.
49.0 Perform program maintenance.
50.0 Create and maintain documentation.
51.0 Evaluate assigned business computer programming tasks.
52.0 Demonstrate an understanding of operating systems, environments, and platforms.
53.0 Develop an awareness of software quality assurance.
54.0 Implement enhanced program structures.
55.0 Develop an understanding of programming techniques and concepts.
56.0 Test programs.
57.0 Plan program design.
58.0 Code programs.
59.0 Perform program maintenance.
60.0 Implement enhanced program structures.

Florida Department of Education
Student Performance Standards

Program Title: Business Computer Programming
Career Certificate Program Number: B070320

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours – SOC Code 15-1151**
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 – 14.0) have been placed in a separate document

Course Number: CTS0041 **Occupational Completion Point: B** **Computer Programmer Assistant – 300 Hours – SOC Code 15-1131**	
15.0	Explore the characteristics, tasks, work attributes, options, and tools associated with a career in software development. – The student will be able to:
15.01	Describe the evolution of programming and programming careers.
15.02	Identify tasks performed by programmers.
15.03	Describe how businesses use computer programming to solve business problems.
15.04	Investigate job opportunities in the programming field.
15.05	Explain different specializations and the related training in the computer programming field.
15.06	Explain the need for continuing education and training of computer programmers.
15.07	Explain enterprise software systems and how they impact business.
15.08	Describe ethical responsibilities of computer programmers.
15.09	Describe the role of customer support to software program quality.
15.10	Identify credentials and certifications that may improve employability for a computer programmer.
15.11	Identify devices, tools, and other environments for which programmers may develop software.
16.0	Demonstrate an understanding of the characteristics, use, and selection of numerical, non-numerical, and logical data types. – The student will be able to:
16.01	Identify the characteristics (*e.g.*, size, limits) and uses of different numerical and non-numerical data types.
16.02	Explain the types and uses of variables in programs.
16.03	Determine the best data type to use for given programming problems.
16.04	Identify the types of operations that can be performed on different data types.
16.05	Evaluate arithmetic and logical expressions using appropriate operator precedence.
16.06	Explain how computers store different data types in memory.
16.07	Demonstrate the difference between "data" and "information".
16.08	Use different number systems to represent data.
16.09	Explain how national and international standards (*i.e.*, ASCII, UNICODE) are used to represent non-numerical data.
16.10	Use Boolean logic to perform logical operations.

17.0	Distinguish between iterative and non-iterative program control structures. – The student will be able to:
17.01	Explain non-iterative programming structures (*e.g.*, if, if/else) and their uses.
17.02	Explain iterative programming structures (*e.g.*, while, do/while) and their uses.
18.0	Differentiate among high level, low level, procedural, object-oriented, compiled, interpreted, and translated programming languages. – The student will be able to:
18.01	Identify the characteristics, uses, and limits of low-level programming languages.
18.02	Identify the characteristics, uses, and limits of high-level programming languages.
18.03	Identify the characteristics, uses, and limits of rapid development programming languages.
18.04	Describe object-oriented concepts.
18.05	Explain the characteristics of procedural and object-oriented programming languages.
18.06	Compare and contrast programming languages that are compiled (*e.g.*, C++), interpreted (*e.g.*, Basic, HTML), and translated (*e.g.*, Java).
19.0	Describe the processes, methods, and conventions for software development and maintenance. – The student will be able to:
19.01	Describe and explain tools used in software development.
19.02	Describe the stages of the program life cycle.
19.03	Compare and contrast alternatives methods of program development (*e.g.*, rapid prototyping, waterfall).
19.04	List and explain the steps in the program development cycle.
19.05	Describe different types of documentation used in the program development cycle (*e.g.*, requirements document, program design documents, test plans).
19.06	Describe the on-going need for program maintenance.
19.07	Describe different methods companies use to facilitate program updates for enhancements and defects (*e.g.*, how customers receive patches, updates, new versions, upgrades).
19.08	Describe different methods used to facilitate version control and change management.
20.0	Explain the types, uses, and limitations of testing for ensuring quality control. – The student will be able to:
20.01	Explain the uses and limits of testing in ensuring program quality.
20.02	Explain testing performed at different stages of the program development cycle (*e.g.,* unit testing, system testing, user acceptance testing).
20.03	Describe data and the use of test plans/scripts to be used in program testing.

	20.04 Describe and identify types of programming errors (*e.g.*, syntactical, logic, usability, requirements mismatch).
	20.05 Identify the data to be used for boundary conditions.
	20.06 Explain different types of testing (*e.g.*, usability, automated, regression) and testing tools.
21.0	Create a program design document using Unified Modeling Language (UML) or other common design tool. – The student will be able to:
	21.01 Describe different design methodologies and their uses (*e.g.*, object-oriented design, structured design, rapid application development).
	21.02 Describe tools for developing a program design (*e.g.*, UML, flowcharts, design documents, pseudocode).
	21.03 Explain the role of existing libraries and packages in facilitating programmer productivity.
	21.04 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).
	21.05 Write a program design document using UML or other standard design methodology.
	21.06 Define input and output for a program module using UML or other standard design methodology.
22.0	Describe information security risks, threats, and strategies associated with software development. – The student will be able to:
	22.01 Explain the security risks to personal and business computer users.
	22.02 Identify different types of threats to computer systems.
	22.03 Identify methods to protect against different threats to computer systems.
	22.04 Understand the importance of a disaster/emergency response plan.
	22.05 Identify alternative methods for data storage and backup (*e.g.*, mirroring, fail-over, high availability, types of backups).
23.0	Design a computer program to meet specific physical, operational, and interaction criteria. – The student will be able to:
	23.01 Choose appropriate data types depending on the needs of the program.
	23.02 Define appropriate user interface prompts for clarity and usability (*e.g.*, user guidance for data ranges, data types).
	23.03 Design and develop program that are designed for efficiency (*e.g.*, less memory usage, less inputs/outputs, faster processing).
	23.04 Identify the software environment required for a program to run (*e.g.*, operating system required, mobile, web-based, desktop, delivery method).
	23.05 Identify the tools required to develop a program (*e.g.*, editors, compilers, linkers, integrated development environments, application programming interfaces (APIs), libraries).
24.0	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:

24.01	Use appropriate naming conventions to define program variables and modules (methods, functions).
24.02	Use a program editor to write the source code for a program.
24.03	Write programs that use selection structures (*e.g.*, if, if/else).
24.04	Write programs that use repetition structures (*e.g.*, while, do/while).
24.05	Write programs that use nested structures.
24.06	Use internal documentation (*e.g.*, single-line and multi-line comments, program headers, module descriptions, and meaningful variable, function/module names) to document a program according to accepted standards.
24.07	Compile and run programs.
24.08	Write programs that use standard arithmetic operators with different numerical data types.
24.09	Write programs that use standard logic operators.
24.10	Write programs that use a variety of common data types.
24.11	Write programs that perform data conversion between standard data types.
24.12	Write programs that define, use, search, and sort arrays.
24.13	Write programs that use user-defined data types.
24.14	Demonstrate understanding and use of appropriate variable scope.
25.0	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:
25.01	Write programs that perform user input and output.
25.02	Write programs that validate user input (*e.g.*, range checking, data formats, valid/invalid characters).
25.03	Write program modules such as functions, subroutines, or methods.
25.04	Write program modules that accept arguments.
25.05	Write program modules that return values.
25.06	Write program modules that validate arguments and return error codes.
25.07	Write interactive programs.
25.08	Write programs that use standard libraries to enhance program function.
25.09	Participate in a peer code review to verify program functionality, programming styles, program usability, and adherence to common

	programming standards.
26.0	Create a unit test plan, implement the plan, and report the results of testing. – The student will be able to:
26.01	Write a unit test plan that identifies the input data and expected results for program tests.
26.02	Test and debug programs, including programs written by others.
26.03	Write a test report that identifies the results of testing.
26.04	Trace through the function of a program to ensure valid operation.
26.05	Identify the system resources used by the program (*e.g.*, memory, disk space, execution time, external devices).
26.06	Create a disaster/emergency response plan for a computer system.
27.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. – The student will be able to:
27.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
27.02	Locate, organize and reference written information from various sources.
27.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
27.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.
27.05	Apply active listening skills to obtain and clarify information.
27.06	Develop and interpret tables and charts to support written and oral communications.
27.07	Exhibit public relations skills that aid in achieving customer satisfaction.
28.0	Solve problems using critical thinking skills, creativity and innovation. – The student will be able to:
28.01	Employ critical thinking skills independently and in teams to solve problems and make decisions.
28.02	Employ critical thinking and interpersonal skills to resolve conflicts.
28.03	Identify and document workplace performance goals and monitor progress toward those goals.
28.04	Conduct technical research to gather information necessary for decision-making.
29.0	Use information technology tools. – The student will be able to:
29.01	Use personal information management (PIM) applications to increase workplace efficiency.
29.02	Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
29.03	Employ computer operations applications to access, create, manage, integrate, and store information.

	29.04 Employ collaborative/groupware applications to facilitate group work.
30.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. – The student will be able to:
	30.01 Employ leadership skills to accomplish organizational goals and objectives.
	30.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	30.03 Conduct and participate in meetings to accomplish work tasks.
31.0	Describe the importance of professional ethics and legal responsibilities. – The student will be able to:
	31.01 Evaluate and justify decisions based on ethical reasoning.
	31.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	31.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.

Course Number: CTS0042 **Occupational Completion Point: C** **Junior Programmer – 300 Hours – SOC Code 15-1131**
32.0 Participate in work-based learning experiences. – The student will be able to:
32.01 Participate in work-based learning experiences in a computer programming environment.
32.02 Compare and contrast programming languages used in a computer programming environment.
32.03 Discuss the management/supervisory skills needed in a computer programming environment.
33.0 Identify functions of information processing. – The student will be able to:
33.01 Identify the advantages and disadvantages of blocking and buffering when accessing data on tape and disk storage.
33.02 Choose appropriate storage of numeric values to insure precision needed for calculations (e.g., integer, fixed-point, floating-point).
34.0 Identify functions of computers. – The student will be able to:
34.01 Identify the advantages and disadvantages of virtual memory.
35.0 Test programs. – The student will be able to:
35.01 Develop a plan for system integration testing.
36.0 Plan program design. – The student will be able to:
36.01 Plan interfaces for systems integration.
37.0 Code programs. – The student will be able to:
37.01 Access external files in a client/server environment.
38.0 Perform program maintenance. – The student will be able to:
38.01 Modify or create new programs for vendor supplied applications.
38.02 Use a computer system with current commercial-end application software to solve problems within an organizational environment.
39.0 Evaluate assigned business computer programming tasks. – The student will be able to:
39.01 Utilize and apply project and time management tools to control systems development.
39.02 Analyze computer resources necessary to run a program.
40.0 Develop an awareness of software quality assurance. – The student will be able to:

	40.01 Evaluate performance, functionality, and validity of various software packages.
41.0	Implement enhanced program structures. – The student will be able to:
	41.01 Write programs to import/export data from external sources.
	41.02 Write routines that incorporate “help” text.
	41.03 Write interactive programs.
	41.04 Design screen layouts for use in interactive programs.
42.0	Develop an understanding of programming techniques and concepts. – The student will be able to:
	42.01 Identify object-oriented concepts and provide examples of objects in an object-oriented language.
	42.02 Describe development methodologies, programming and system languages, database technologies, and data communication.
43.0	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:
	43.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	43.02 Explain emergency procedures to follow in response to workplace accidents.
	43.03 Create a disaster and/or emergency response plan.
44.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. – The student will be able to:
	44.01 Employ leadership skills to accomplish organizational goals and objectives.
	44.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	44.03 Conduct and participate in meetings to accomplish work tasks.
	44.04 Employ mentoring skills to inspire and teach others.
45.0	Explain the importance of employability skill and entrepreneurship skills. – The student will be able to:
	45.01 Identify and demonstrate positive work behaviors needed to be employable.
	45.02 Develop personal career plan that includes goals, objectives, and strategies.
	45.03 Examine licensing, certification, and industry credentialing requirements.
	45.04 Maintain a career portfolio to document knowledge, skills, and experience.
	45.05 Evaluate and compare employment opportunities that match career goals.

45.06	Identify and exhibit traits for retaining employment.
45.07	Identify opportunities and research requirements for career advancement.
45.08	Research the benefits of ongoing professional development.
45.09	Examine and describe entrepreneurship opportunities as a career planning option.

Course Number: CTS0043 **Occupational Completion Point: D** **Junior Programmer II – 300 Hours – SOC Code 15-1131**
46.0 Test programs. – The student will be able to:
46.01 Develop a plan for testing programs.
46.02 Develop a plan for system integration testing.
46.03 Develop data for use in program testing.
46.04 Perform debugging activities.
46.05 Distinguish among the different types of program and design errors.
46.06 Evaluate program test results.
46.07 Execute programs and subroutines as they relate to the total application.
46.08 Use trace routines of compilers to assist in program debugging.
46.09 Compile and run programs.
47.0 Plan program design. – The student will be able to:
47.01 Formulate a plan to determine program specifications individually or in groups.
47.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
47.03 Design programs to solve problems using problem-solving strategies.
47.04 Prepare proper input/output layout specifications.
47.05 Examine existing utility programs and subroutines for use with other programs.
47.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
48.0 Code programs. – The student will be able to:
48.01 Utilize reference manuals.
48.02 Write programs according to recognized programming standards.
48.03 Write internal documentation statements as needed in the program source code.
48.04 Code programs in high-level languages for business applications.

	48.05 Write code that accesses sequential, indexed sequential, random, and direct files.
	48.06 Code programs using logical statements (e.g., If-Then-Else, Do...While).
	48.07 Enter and modify source code using a program language editor.
	48.08 Code routines within programs that validate input data.
	48.09 Use the rounding function in calculations within programs.
49.0	Perform program maintenance. –The student will be able to:
	49.01 Review requested modification of programs and establish a plan of action.
	49.02 Design needed modifications in conformance with established standards.
	49.03 Code, test, and debug modifications prior to updating production code.
	49.04 Update production programs and documentation with changes.
	49.05 Analyze output to identify and annotate errors or enhancements.
	49.06 Modify or create new programs for vendor supplied applications.
	49.07 Use a computer system with current commercial-end application software to solve problems within an organizational environment.
50.0	Create and maintain documentation. – The student will be able to:
	50.01 Write documentation to assist operators and end-users.
	50.02 Follow established documentation standards.
	50.03 Update existing documentation to reflect program changes.
51.0	Evaluate assigned business computer programming tasks–The student will be able to:
	51.01 Utilize and apply project and time management tools to control systems development.
	51.02 Analyze computer resources necessary to run a program.
52.0	Demonstrate an understanding of operating systems, environments, and platforms. – The student will be able to:
	52.01 Assess and analyze the functions of different operating systems.
	52.02 Assess and analyze the program development and execution utilities of relevant operating systems.
53.0	Develop an awareness of software quality assurance. – The student will be able to:
	53.01 Evaluate performance, functionality, and validity of various software packages.

54.0	Implement enhanced program structures. – The student will be able to:
	54.01 Write programs that incorporate multi-level subtotals and page breaks.
	54.02 Write programs that include tables or arrays and routines for data entry and lookup.
	54.03 Write routines to sort arrays.
	54.04 Write programs that sort records in files.
	54.05 Write programs to create and maintain a master file.
	54.06 Write programs to process transactions.
	54.07 Write programs to import/export/convert data from external sources.
	54.08 Write programs that use iteration.
	54.09 Write routines that incorporate “help” text.
	54.10 Write programs that read and write sequential files.
	54.11 Write programs that read and write indexed-sequential files.
	54.12 Write programs that read and write random files.
	54.13 Write interactive programs.
	54.14 Design screen layouts for use in interactive programs.
	54.15 Write programs using object-oriented languages.
55.0	Develop an understanding of programming techniques and concepts. – The student will be able to:
	55.01 Describe development methodologies, programming and system languages, database technologies, and data communication.

Course Number: CTS0044 **Occupational Completion Point: E** **Computer Programmer – 150 Hours – SOC Code 15-1131**
56.0 Test programs. – The student will be able to:
56.01 Develop a plan for testing programs.
56.02 Develop a plan for system integration testing.
56.03 Develop data for use in program testing.
56.04 Perform debugging activities.
56.05 Distinguish among the different types of program and design errors.
56.06 Evaluate program test results.
56.07 Execute programs and subroutines as they relate to the total application.
56.08 Use trace routines of compilers to assist in program debugging.
57.0 Plan program design. – The student will be able to:
57.01 Formulate a plan to determine program specifications individually or in groups.
57.02 Use a graphical representation or pseudo code to represent the structure in a program or subroutine.
57.03 Design programs to solve problems using problem-solving strategies.
57.04 Prepare proper input/output layout specifications.
57.05 Examine existing utility programs and subroutines for use with other programs.
57.06 Manually trace the execution of programs and verify that programs follow the logic of their design as documented.
58.0 Code programs. – The student will be able to:
58.01 Utilize reference manuals.
58.02 Write programs according to recognized programming standards.
58.03 Write internal documentation statements as needed in the program source code.
58.04 Code programs in high-level languages for business applications.
58.05 Write code that accesses sequential, indexed sequential, random, and direct files.

	58.06 Code programs using logical statements (e.g., If-Then-Else, Do-While).
	58.07 Enter and modify source code using a program language editor.
	58.08 Code routines within programs that validate input data.
	58.09 Use the rounding function in calculations within programs.
59.0	Perform program maintenance. – The student will be able to:
	59.01 Review requested modification of programs and establish a plan of action.
	59.02 Design needed modifications in conformance with established standards.
	59.03 Code, test, and debug modifications prior to updating production code.
	59.04 Update production programs and documentation with changes.
	59.05 Analyze output to identify and annotate errors or enhancements.
60.0	Implement enhanced program structures. – The student will be able to:
	60.01 Write programs that include tables or arrays and routines for data entry and lookup.
	60.02 Write programs that use iteration.
	60.03 Write routines that incorporate “help” text.
	60.04 Write programs that read and write sequential files.
	60.05 Write programs that read and write indexed-sequential files.
	60.06 Write programs that read and write random files.
	60.07 Write interactive programs.
	60.08 Design screen layouts for use in interactive programs.
	60.09 Write programs using object-oriented languages.
	60.10 Write programs that include data structures (e.g., stacks, queues, trees, linked lists).
	60.11 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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 10, Language 9, and Reading 9. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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

Career Certificate Program	
Program Number	B078000
CIP Number	0511090102
Grade Level	30, 31
Standard Length	1050 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1142 – Network and Computer Systems Administrators 15-1143 – Computer Network Architects
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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	SOC Code
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours	15-1151
B	EEV0504	Computer Support Assistant	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	150 hours	15-1151
C	CTS0022	Network Support Help Desk Assistant		150 hours	15-1142
D	CTS0023	Network Support Administrator		150 hours	15-1142
E	CTS0024	Senior Network Administrator		150 hours	15-1143
F	CTS0029	Wireless Network Administrator		150 hours	15-1143
G	EEV0317	Data Communications Analyst		150 hours	15-1143

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 14.0 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 systems to accomplish job objectives and enhance workplace performance.
02.0 Develop an awareness of microprocessors and digital computers.
03.0 Demonstrate an understanding of operating systems.
04.0 Use technology to enhance the effectiveness of communication skills utilizing word processing applications.
05.0 Use technology to enhance communication skills utilizing presentation applications.
06.0 Use technology to enhance the effectiveness of communication utilizing spreadsheet and database applications.
07.0 Use technology to enhance communication skills utilizing electronic mail.
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 Demonstrate competence in page design applicable to the WWW.
12.0 Develop an awareness of emerging technologies.
13.0 Develop awareness of computer languages and software applications.
14.0 Demonstrate comprehension and communication skills.
15.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
16.0 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.
17.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment.
18.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace.
19.0 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.
20.0 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.
21.0 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.
22.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact.
23.0 Demonstrate proficiency using graphical user interface (GUI) operating systems.

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

62.0 Participate in simulated work-based learning experiences.
63.0 Compare and contrast hierarchical network design models and scalable internetworks.
64.0 Discuss advanced IP addressing management.
65.0 Demonstrate proficiency in basic router configuration.
66.0 Demonstrate proficiency in the use of OSPF.
67.0 Understand and discuss multi-area OSPF operation and configuration.
68.0 Demonstrate the use of stub and totally stubby areas.
69.0 Demonstrate proficiency in route optimization.
70.0 Demonstrate proficiency in the use of BGP.
71.0 Define and show proficiency in security.
72.0 Use lab equipment, demonstrate the setup, configuration, connectivity of routers to create a small WAN.
73.0 Configure and monitor DSL and DDR.
74.0 Demonstrate the use of scaling IP addresses with NAT.
75.0 Demonstrate proficiency using Authentication, Authorization & Accounting AAA to scale access control.
76.0 Understand and describe key characteristics of various switching technologies, LAN switching and the hierarchical model of network design, and the 3-tier model.
77.0 Understand and describe campus networks, design models, and switching technologies.
78.0 Show proficiency configuring a switch.
79.0 Demonstrate proficiency configuring VLANS.
80.0 Understand and explain spanning tree protocol (STP) and redundant links.
81.0 Demonstrate proficiency with multilayer switching.
82.0 Demonstrate the use of hot standby routing protocol (HSRP).
83.0 Understand and use IGMP and multicasting.
84.0 Demonstrate proficiency restricting network access.
85.0 Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools.
86.0 List and define the commonly used protocols, routing techniques, and switching processes.
87.0 Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANS, frame relay, and ISDN.
88.0 Participate in simulated work-based learning experiences.
89.0 Demonstrate proficiency in applying radio frequency (RF) technologies.
90.0 Develop an awareness of wireless LAN technologies.
91.0 Perform implementation and management activities.
92.0 Develop an awareness of wireless security systems.
93.0 Demonstrate knowledge of wireless industry standards.
94.0 Participate in simulated work-based learning experiences.
95.0 Demonstrate knowledge of general security concepts.
96.0 Develop an awareness of communication security concepts.
97.0 Develop an awareness of network infrastructure security.
98.0 Develop an awareness of cryptography and its relation to security.
99.0 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 – SOC Code 15-1151**
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 – 14.0) have been placed in a separate document.

Course Number: EEV0504 **Occupational Completion Point: B** **Computer Support Assistant – 150 Hours – SOC Code 15-1151**	
15.0	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:
15.01	Develop strategies for resolving customer conflicts.
16.0	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:
16.01	Identify and describe the functions of main processing boards.
16.02	Identify and describe the functions of communication ports.
16.03	Identify and describe the functions of peripheral devices.
16.04	Identify and describe the components of portable systems.
16.05	Troubleshoot, install and upgrade computers and peripherals.
16.06	Perform system hardware setup.
16.07	Demonstrate an understanding of input/output devices.
16.08	Installation and configuration of applications software, hardware, and device drivers.
16.09	Demonstrate an understanding of the operation and purpose of hardware components.
16.10	Install operating system software.
16.11	Customize operating systems.
16.12	Install application software.
16.13	Perform storage formatting and preparation activities.
16.14	Identify data measurement.
16.15	Install and configure RAID.
16.16	Recognize and report on server room environmental issues.
17.0	Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. – The student will be able to:
17.01	Troubleshoot a personal computer system.

	17.02 Identify configuration problems.
	17.03 Identify software problems.
	17.04 Identify hardware malfunctions.
	17.05 Identify network malfunctions.
	17.06 Resolve computer error messages.
	17.07 Understand and troubleshoot memory and cache systems.
	17.08 Verify that drives are the appropriate type.
	17.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.
18.0	Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. – The student will be able to:
	18.01 Apply basic rules for hardware safety.
	18.02 Demonstrate proficiency in basic preventative hardware maintenance.
	18.03 Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
	18.04 Apply ergonomic principles applicable to the configuration of computer workstations.
	18.05 Describe ethical issues and problems associated with computers and information systems**.**
19.0	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:
	19.01 Identify Random Access Memory (RAM) types.
	19.02 Identify I/O ports and devices.
20.0	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:
	20.01 Identify types of printers.
	20.02 Identify care and service techniques and common problems with primary printer types.
	20.03 Implement and manage printing on a network.
21.0	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:
	21.01 Define networking and describe the purpose of a network.
	21.02 Identify the purposes and interrelationships among the major components of networks.
	21.03 Describe the various types of network topologies.
	21.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
	21.05 Configure network and verify network connectivity.
	21.06 Discuss the responsibilities of the network.
	21.07 Develop user logon procedures.
	21.08 Utilize network management infrastructures to perform administrative tasks.
	21.09 Identify common backup strategies and procedures.
	21.10 Select and use appropriate electronic communications software and hardware for specific tasks.
	21.11 Compare and contrast Internet software and protocols.
	21.12 Diagnose and resolve electronic communications operational problems.
	21.13 Design and implement directory tree structures.
	21.14 Install services tools.
	21.15 Perform and verify backups.
	21.16 Identify bottlenecks.
	21.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
	21.18 Document and test disaster recovery plan regularly, and update as needed.
22.0	Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. – The student will be able to:
	22.01 Apply call center vocabulary.
	22.02 Listen and input information simultaneously.
	22.03 Apply first response assistance for minor repair work.
23.0	Demonstrate proficiency using graphical user interface (GUI) operating systems. – The student will be able to:

23.01 Identify parts of GUI windows.
23.02 Demonstrate proficiency in using menu systems.
23.03 Demonstrate proficiency in using pointing and selection devices.
23.04 Identify keyboard shortcuts and special function keys.
23.05 Demonstrate proficiency in manipulating windows.
23.06 Utilize help systems and hypertext links.
23.07 Create, organize, and maintain file system directories.
23.08 Organize desktop objects.
23.09 Run multiple applications.

Course Number: CTS0022 **Occupational Completion Point: C** **Network Support Help Desk Assistant – 150 Hours – SOC Code 15-1142**	
24.0	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:
24.01	Develop diplomatic methods to communicate with customers.
25.0	Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. – The student will be able to:
25.01	Apply first response assistance for minor repair work.
26.0	Understand, describe, and explain internet connections. – The student will be able to:
26.01	Understand the physical connectivity necessary for a computer to connect to the Internet.
26.02	Recognize the primary components of a computer.
26.03	Install and troubleshoot network interface cards and/or modems.
26.04	Use basic testing procedures to test the Internet connection.
26.05	Demonstrate a basic understanding of the use of web browsers and plug-ins.
27.0	Define networking terminology. – The student will be able to:
27.01	Explain the importance of bandwidth in networking.
27.02	Identify bps, kbps, Mbps, and Gbps as units of bandwidth.
27.03	Explain the difference between bandwidth and throughput.
27.04	Explain the development of the Open System Interconnection model (OSI).
27.05	List the advantages of a layered approach.
27.06	Identify each of the seven layers of the OSI model.
27.07	Identify the four layers of the TCP/IP model.
27.08	Describe the similarities and differences between the two models.
27.09	Briefly outline the history of networking.
27.10	Identify devices used in networking.

	27.11 Understand the role of protocols in networking.
	27.12 Define types of area networks.
	27.13 Explain VPNs and their advantages.
	27.14 Describe the differences between intranets and extranets.
28.0	Explain how to connect copper media, optical media, and wireless media. – The student will be able to:
	28.01 Discuss the electrical properties of matter.
	28.02 Define voltage, resistance, impedance, current, and circuits.
	28.03 Describe the specifications and performances of different types of cable.
	28.04 Describe coaxial cable and its advantages and disadvantages over other types of cable.
	28.05 Describe shielded twisted-pair (STP) cable and unshielded twisted-pair cable (UTP) and its uses.
	28.06 Discuss the characteristics of straight-through, crossover, and rollover cables and where each is used.
	28.07 Explain the basics of fiber-optic cable.
	28.08 Describe how fibers can guide light for long distances.
	28.09 Describe multimode and single-mode fiber.
	28.10 Describe how fiber is installed.
	28.11 Describe the type of connectors and equipment used with fiber-optic cable.
	28.12 Explain how fiber is tested to ensure that it will function properly.
	28.13 Discuss safety issues dealing with fiber-optics.
29.0	Perform tasks related to network cable testing and cable making. – The student will be able to:
	29.01 Differentiate between sine waves and square waves.
	29.02 Define basic terminology related to time, frequency, and noise.
	29.03 Differentiate between digital bandwidth and analog bandwidth.
	29.04 Compare and contrast noise levels on various types of cabling.
	29.05 Define and describe the effects of attenuation and impedance mismatch.

	29.06 Define crosstalk, near-end crosstalk, far-end crosstalk, and power sum near-end crosstalk.
	29.07 Describe how crosstalk and twisted pairs help reduce noise.
	29.08 Describe the ten copper cable tests defined in TIA/EIA-568-A/B.
	29.09 Describe the difference between Category 5 and Category 6 cable.
30.0	Define network topologies, devices and connections. – The student will be able to:
	30.01 Identify characteristics of Ethernet networks.
	30.02 Identify straight-through, crossover, and rollover cable.
	30.03 Describe various intermediary network devices.
	30.04 Describe the function of peer-to-peer networks.
	30.05 Describe the function, advantages, and disadvantages of client-server networks.
	30.06 Describe and differentiate between serial, digital subscriber line (DSL), and cable modem WAN connections.
	30.07 Identify router serial ports and their cable and connectors.
	30.08 Identify and describe the placement of equipment used in various WAN configurations.
31.0	Define Ethernet fundamentals and operations. – The student will be able to:
	31.01 Describe the basics of Ethernet technology.
	31.02 Explain naming rules of Ethernet technology.
	31.03 Define how Ethernet and the OSI model interact.
	31.04 Describe the Ethernet framing process and frame structure.
	31.05 List Ethernet frame field names and purposes.
	31.06 Identify the characteristics of CSMA/CD.
	31.07 Describe the key aspects of Ethernet timing, interframe spacing and backoff time after a collision.
	31.08 Define Ethernet errors and collisions.
	31.09 Explain the concept of auto-negotiation in relation to speed and duplex.
32.0	Define and explain the functions of bridges and switches. – The student will be able to:

	32.01 Define bridging and switching.
	32.02 Define and describe the content-addressable memory (CAM) table.
	32.03 Define latency.
	32.04 Describe store-and forward and cut-through switching modes.
	32.05 Explain Spanning-Tree Protocol (STP).
	32.06 Define collisions, broadcasts, collision domains, and broadcast domains.
	32.07 Identify the Layer 1, 2, and 3 devices used to create collision domains and broadcast domains.
	32.08 Discuss data flow and problems with broadcasts.
	32.09 Explain network segmentation and list the devices used to create segments.
33.0	Explain the mathematical concepts and protocols behind the internet. – The student will be able to:
	33.01 Explain why the Internet was developed and how TCP/IP fits the design of the Internet.
	33.02 List the four layers of the TCP/IP model.
	33.03 Describe the functions of each layer of the TCP/IP model.
	33.04 Compare the OSI model and the TCP/IP model.
	33.05 Describe the function and structure of IP addresses.
	33.06 Understand why subnetting is necessary.
	33.07 Explain the difference between public and private addressing.
	33.08 Understand the function of reserved IP addresses.
	33.09 Explain the use of static and dynamic addressing for a device.
	33.10 Use ARP to obtain the MAC address to send a packet to another device.
	33.11 Understand the issues related to addressing between networks.
	33.12 Demonstrate proficiency with IPv6.
34.0	Define and explain the difference between routed and routing protocols. – The student will be able to:
	34.01 Describe routed (routable) protocols.

	34.02 List the steps of data encapsulation in an internetwork as data is routed to one or more Layer 3 devices.
	34.03 Describe connectionless and connection-oriented delivery.
	34.04 Name the IP packet fields.
	34.05 Describe process of routing.
	34.06 Compare and contrast different types of routing protocols.
	34.07 List and describe several metrics used by routing protocols.
	34.08 List several uses for subnetting.
	34.09 Determine the prefix/subnet mask for a given situation.
	34.10 Use a prefix/subnet mask to determine the subnet ID.
35.0	Recognize, define, and explain functions of the transport layer. – The student will be able to:
	35.01 Describe the functions of the TCP/IP transport layer.
	35.02 Describe flow control.
	35.03 Describe the processes of establishing a connection between peer systems.
	35.04 Describe windowing.
	35.05 Describe acknowledgment.
	35.06 Identify and describe transport layer protocols.
	35.07 Describe TCP and UDP header formats.
	35.08 Describe TCP and UDP port numbers and ports used for services and clients.
	35.09 List the major protocols of the TCP/IP application layer.
	35.10 Provide a brief description of the features and operation of well-known TCP/IP applications.
	35.11 Describe TCP and UDP with its function.
	35.12 Describe TCP synchronization and flow control.
	35.13 Describe multiple conversations between hosts.
	35.14 Understand the differences and the relationship between MAC addresses, IP addresses, and port numbers.

36.0	Explain, define, and identify the components of a WAN and router. – The student will be able to:
36.01	Explain the difference between a WAN and LAN and the type of addresses each uses.
36.02	Describe the role of a router in a WAN.
36.03	Identify internal components of the router and describe their functions.
36.04	Describe the physical characteristics of the router.
36.05	Identify common ports on a router.
36.06	Properly connect FastEthernet, serial WAN, and console ports.
37.0	Describe and identify an operating system for a router. – The student will be able to:
37.01	Describe the purpose of the router operating system.
37.02	Describe the basic operation of the router operating system.
37.03	Identify various router operating system features.
37.04	Identify the methods to establish a CLI session with the router.
37.05	Establish a terminal emulation session on a router.
37.06	Log into a router.
37.07	Use the help feature in the command line interface.
37.08	Troubleshoot command errors.
37.09	Name a router.
37.10	Set passwords.
37.11	Explore router configuration commands.
37.12	Configure router interface.
37.13	Upgrade router operating system.
37.14	Configure an interface description.
37.15	Configure banner message.
37.16	Understand the importance of version control.

	37.17 Save changes to a router.
38.0	Explain how to establish connections between neighboring routers. – The student will be able to:
	38.01 Enable and disable protocols.
	38.02 Determine which neighboring devices are connected to which local interfaces.
	38.03 Establish, Verify, Disconnect, Suspend a Telnet connection.
	38.04 Perform alternative connectivity tests.
	38.05 Troubleshoot remote terminal connections.
39.0	Identify and explain the router boot sequence and file system. – The student will be able to:
	39.01 Identify the stages of the router boot sequence.
	39.02 Determine how a router locates and loads its operating system.
	39.03 Use the boot system command.
	39.04 Identify the configuration register values.
	39.05 Briefly describe the files used by the router operating system and their functions.
	39.06 List the locations on the router of the different file types.
	39.07 Save and restore configuration files using TFTP and copy-and paste.
	39.08 Load a router operating system image using TFTP.
	39.09 Verify the file system.
40.0	Identify and explain static and dynamic routing protocols. – The student will be able to:
	40.01 Explain the significance of static routing.
	40.02 Configure static and default routes.
	40.03 Verify and troubleshoot static and default routes.
	40.04 Identify routing protocols.
	40.05 Identify distance vector routing protocols.
	40.06 Identify link-state routing protocols.

	40.07 Describe the basic characteristics of common routing protocols.
	40.08 Identify interior gateway protocols.
	40.09 Identify exterior gateway protocols BGP.
	40.10 Enable Routing Information Protocol (RIP) on a router.
41.0	Describe and configure distance vector protocols. – The student will be able to:
	41.01 Describe how routing loops can occur in distance vector routing.
	41.02 Describe several methods used by distance vector routing protocols to ensure that routing information is accurate.
	41.03 Configure RIP.
42.0	Perform tasks related to protocol troubleshooting. – The student will be able to:
	42.01 Describe ICMP.
	42.02 Describe the ICMP message format and error message types.
	42.03 Identify potential causes of specific ICMP error messages.
	42.04 Describe ICMP control messages.
	42.05 Identify a variety of ICMP control messages used in networks today.
	42.06 Determine the causes for ICMP control messages.
43.0	Examine and test networks. – The student will be able to:
	43.01 Use the commands to gather detailed information about the routes installed on the router.
	43.02 Configure a default route or default network.
	43.03 Understand how a router uses both Layer 2 and Layer addressing to move data through the network.
44.0	Define, explain and describe access lists. – The student will be able to:
	44.01 Describe the differences between standard and extended ACLs.
	44.02 Explain the rules for placement of ACLs.
	44.03 Create and apply named ACLs.
	44.04 Describe the function of firewalls.

	44.05 Use ACLs to restrict virtual terminal access.
45.0	Solve problems using critical thinking skills, creativity and innovation. – The student will be able to:
	45.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	45.02 Employ critical thinking and interpersonal skills to resolve conflicts.
	45.03 Identify and document workplace performance goals and monitor progress toward those goals.
	45.04 Conduct technical research to gather information necessary for decision-making.
46.0	Use information technology tools. – The student will be able to:
	46.01 Use personal information management (PIM) applications to increase workplace efficiency.
	46.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	46.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	46.04 Employ collaborative/groupware applications to facilitate group work.
47.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. – The student will be able to:
	47.01 Describe the nature and types of business organizations.
	47.02 Explain the effect of key organizational systems on performance and quality.
	47.03 List and describe quality control systems and/or practices common to the workplace.
	47.04 Explain the impact of the global economy on business organizations.
48.0	Describe the importance of professional ethics and legal responsibilities. – The student will be able to:
	48.01 Evaluate and justify decisions based on ethical reasoning.
	48.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	48.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	48.04 Interpret and explain written organizational policies and procedures such as Sarbanes-Oxley, HIPPA, Gramm-Leach-Bliley.

Course Number: CTS0023 **Occupational Completion Point: D** **Network Support Administrator – 150 Hours – SOC Code 15-1142**	
49.0	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:
	49.01 Develop diplomatic methods to communicate with customers.
50.0	Participate in simulated work-based learning experiences. – The student will be able to:
	50.01 Participate in simulated work-based learning experiences in a network support services environment.
	50.02 Discuss the use of technology in a network support services environment.
51.0	Provide network support and assistance by troubleshooting and diagnosing through direct contact remote access. – The student will be able to:
	51.01 Apply appropriate diagnostic techniques to solve network problems.
	51.02 Perform local network support using various troubleshooting and diagnostic techniques.
	51.03 Perform remote network support using various remote access methods.
52.0	Perform logical and physical network design activities. – The student will be able to:
	52.01 Describe the various LAN communication problems.
	52.02 Describe the effects of LAN segmentation with bridges, routers, and switches.
	52.03 Describe the operation, characteristics and benefits of VLANS.
	52.04 Explain and identify LAN design goals, issues, and methodology.
	52.05 Demonstrate the ability to analyze equipment necessary to meet specific design requirement.
	52.06 Demonstrate the ability to create physical and logical network implementation documentation.
53.0	Demonstrate proficiency in selecting appropriate routing protocols and IP configuration for various network designs. – The student will be able to:
	53.01 Describe the two parts of network addressing, and then identify the parts in specific protocol address examples.
	53.02 Demonstrate proficiency with IP addresses.
	53.03 Configure IP addresses.
	53.04 Verify IP addresses.

	53.05 Identify the functions of the TCP/IP transport-layer protocols.
	53.06 Identify the functions of the TCP/IP network-layer protocols.
	53.07 Identify the functions performed by ICMP.
	53.08 Explain the services of separate and integrated multi-protocol routing.
	53.09 List problems that each routing type encounters when dealing with topology changes and describe techniques to reduce the number of these problems.
54.0	Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security. – The student will be able to:
	54.01 Define and describe the purpose and operation of network traffic filtering.
	54.02 Demonstrate proficiency in using configuration and interface commands to perform and monitor network traffic filtering.
55.0	Perform network management activities related to documentation, security, performance, administration, troubleshooting and coping with environmental factors. – The student will be able to:
	55.01 Perform documentation activities for networks, such as logs, journals, diagrams, labeling schemes, layouts, software listings, user policy, security policy.
	55.02 Plan network security measures by establishing security policies and procedures, including user policies, authentication procedures, back-up and data recovery procedures, and redundancy techniques.
	55.03 Demonstrate proficiency in using network monitoring software.
	55.04 Explain the procedures necessary to monitor, create benchmarks, and plan for improvement of network performance.
	55.05 Explain the administrative side of network management, including physical and logical boundaries, costs, error report documentation and the management of human resources.
56.0	Identify and describe various WAN functions, devices, and demonstrate understanding of the WAN design process. – The student will be able to:
	56.01 Describe the major features of WAN technology, including, devices, standards, encapsulation, link options, and packet and circuit switching.
	56.02 Perform WAN design activities that require using the necessary steps in WAN design, the three-layered design model, and various other design models.
57.0	Describe the operation and implementation of virtual private networks. – The student will be able to:
	57.01 Describe the virtual private network operation.
	57.02 Describe the virtual private network implementation.
	57.03 Demonstrate an understanding of tunneling.
	57.04 Describe secure VPN’s.

58.0	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:
58.01	Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
58.02	Explain emergency procedures to follow in response to workplace accidents.
58.03	Create a disaster and/or emergency response plan.
59.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. – The student will be able to:
59.01	Employ leadership skills to accomplish organizational goals and objectives.
59.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
59.03	Conduct and participate in meetings to accomplish work tasks.
59.04	Employ mentoring skills to inspire and teach others.
60.0	Explain the importance of employability skill and entrepreneurship skills. – The student will be able to:
60.01	Identify and demonstrate positive work behaviors needed to be employable.
60.02	Develop personal career plan that includes goals, objectives, and strategies.
60.03	Examine licensing, certification, and industry credentialing requirements.
60.04	Maintain a career portfolio to document knowledge, skills, and experience.
60.05	Evaluate and compare employment opportunities that match career goals.
60.06	Identify and exhibit traits for retaining employment.
60.07	Identify opportunities and research requirements for career advancement.
60.08	Research the benefits of ongoing professional development.
60.09	Examine and describe entrepreneurship opportunities as a career planning option.
61.0	Demonstrate personal money-management concepts, procedures, and strategies. – The student will be able to:
61.01	Identify and describe the services and legal responsibilities of financial institutions.
61.02	Describe the effect of money management on personal and career goals.
61.03	Develop a personal budget and financial goals.
61.04	Complete financial instruments for making deposits and withdrawals.

61.05 Maintain financial records.
61.06 Read and reconcile financial statements.
61.07 Research, compare and contrast investment opportunities.

Course Number: CTS0024 **Occupational Completion Point: E** **Senior Network Administrator – 150 Hours – SOC Code 15-1143**	
62.0	Participate in simulated work-based learning experiences. – The student will be able to:
62.01	Participate in simulated work-based learning experiences in a network support services environment.
62.02	Discuss the use of technology in a network support services environment.
63.0	Compare and contrast hierarchical network design models and scalable internetworks. – The student will be able to:
63.01	Show proficiency in the use of the three-layer hierarchical design model.
63.02	Describe router functions in the core layer, distribution layer, and access layer.
63.03	Describe key characteristics of making the network reliable, available, responsive, efficient, adaptable, accessible, scalable and secure.
64.0	Discuss advanced IP addressing management. – The student will be able to:
64.01	Describe and explain IPv4 addressing, Internet's address architecture, classes of IP addresses, and perform subnet masking.
64.02	Understand and explain Classless Interdomain Routing (CIDR), route aggregation, supernetting and address allocation.
64.03	Discuss and explain Variable-Length Subnet Masks along with classless and classful routing protocols.
64.04	Compare and contrast route summarization and route flapping.
64.05	Describe and discuss Network Address Translation (NAT), private addressing with NAT, private IP addresses (RFC 1918) and discontiguous subnets.
64.06	Describe thefunctions of private addressing and be able to explain the major fetures of and configure NAT, PAT, and DHCP.
64.07	Configure IOS DHCP server, Easy IP and IP helper addresses.
64.08	Discuss IP addressing crisis and solutions with IPv6 address formats.
65.0	Demonstrate proficiency in basic router configuration. – The student will be able to:
65.01	Configure VLSM using routing fundamentals.
65.02	Configure static routing and dynamic routing using distance-vector routing protocols, link-state routing protocols, and hybrid routing.
65.03	Configure static default routes and default routing with EIGRP using default route caveats and floating static routes.
65.04	Describe and explain convergence issues and route calculation fundamentals.

	65.05 Start routing process using various configurations, initiate routing updates and routing metrics.
66.0	Demonstrate proficiency in the use of OSPF. – The student will be able to:
	66.01 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.
	66.02 Establish router adjacencies, elect a DR and a BDR, and discover routes.
	66.03 Select appropriate routes and maintain routing information, configuring OSPF on routers within a single area.
	66.04 Use optional configuration commands and configure OSPF over NBMA in a lab setting.
	66.05 Describe Full-Mesh Frame Relay, Partial-Mesh Frame Relay, Point-to-Multipoint OSPF.
67.0	Understand and discuss multi-area OSPF operation and configuration. – The student will be able to:
	67.01 Configure OSPF, examining the DR/BDR election process.
	67.02 Configure Point-to-Multipoint OSPF over frame relay, create multiple OSPF areas, use OSPF router types, and incorporate OSPF LSA and area types.
	67.03 Configuring OSPF operation across multiple areas and flooding LSUs to multiple areas, updating the routing table.
	67.04 Configure Multi-area OSPF, using and configuring OSPF multi-area components, and configuring OSPF route summarization.
	67.05 Verify OSPF operation, show commands, clear and debug commands.
68.0	Demonstrate the use of stub and totally stubby areas. – The student will be able to:
	68.01 Demonstrate understanding of stub and totally stubby areas.
	68.02 Set up an OSPF stub area configuration example.
	68.03 Monitor multi-area OSPF, verifying multi-area OSPF operation.
	68.04 Create a multi-area OSPF.
69.0	Demonstrate proficiency in route optimization. – The student will be able to:
	69.01 Show how to control routing updates, policy routing, and route redistribution.
	69.02 Create a route optimization configuration in lab setting.
70.0	Demonstrate proficiency in the use of BGP. – The student will be able to:
	70.01 Define and explain autonomous systems and basic BGP operations.
	70.02 Configure and monitor BGP operations and routing process.

	70.03 Define and explain BGP attributes and the BGP decision process.
	70.04 Create BGP configuration in lab setting.
	70.05 Develop a scaling BGP and route reflectors.
	70.06 Set up BGP route filtering and policy routing.
	70.07 Explain the community attribute and peer groups.
	70.08 Explain redundancy, symmetry, and load balancing.
	70.09 Define and explain BGP redistribution.
	70.10 Perform scaling BGP lab exercises and configure BGP in a lab setting.
71.0	Define and show proficiency in security. – The student will be able to:
	71.01 Show proficiency in securing router access using access lists.
	71.02 Show proficiency in using dynamic access lists.
	71.03 Show proficiency in session filtering.
	71.04 Define and explain context-based access control.
	71.05 Use an alternative to access lists.
	71.06 Configure router security in a lab setting.
72.0	Using lab equipment, demonstrate the setup, configuration, and the connectivity of routers to create a small WAN. – The student will be able to:
	72.01 Demonstrate the use of remote access.
	72.02 Select appropriate WAN technologies for different scenarios.
	72.03 Select remote access solutions for different technologies.
	72.04 Assemble and cable WAN components.
73.0	Configure and monitor DSL and DDR. – The student will be able to:
	73.01 Explain and discuss DSL architecture and DSL protocol layers.
	73.02 Configure DSL, static routing and default routing, and DSL PRI.
	73.03 Create optional configurations.

	73.04 Monitor the DSL interface.
	73.05 Create DSL configurations.
74.0	Demonstrate the use of scaling IP addresses with NAT. – The student will be able to:
	74.01 Define and explain NAT concepts and terminology.
	74.02 Demonstrate proficiency in configuring, creating and verifying NAT configurations in lab setting.
75.0	Demonstrate proficiency using Authentication, Authorization and Accounting (AAA) to scale access control. – The student will be able to:
	75.01 List and define AAA concepts and terminology.
	75.02 Demonstrate proficiency configuring AAA.
	75.03 Perform lab exercises using access control configurations.
76.0	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:
	76.01 Discuss the requirements of the evolving campus structure and the issues with traditional network designs.
	76.02 Describe the fundamental campus elements and contributing variables to campus networks.
	76.03 Compare and contrast the traditional 80/20 rule of network traffic and the new 20/80 rule of network traffic.
	76.04 Discuss switching and the OSI model, layer 2, 3, and 4 switching, and multilayer switching.
	76.05 Discuss the core layer, the distribution layer, and the access layer in relation to switching.
	76.06 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.
77.0	Understand and describe campus networks, design models, and switching technologies. – The student will be able to:
	77.01 List and explain key characteristics of various switching technologies.
	77.02 Discuss LAN switching and the hierarchical model of network design.
	77.03 Show proficiency using the 3-tier model to networking.
78.0	Show proficiency configuring a switch. – The student will be able to:
	78.01 Demonstrate the process for initial connectivity to a switch.
	78.02 Show proficiency creating the basic configuration of a switch.
	78.03 List and explain important switch operating system features.

79.0	Demonstrate proficiency configuring VLANS. – The student will be able to:
	79.01 Understand and explain VLANs.
	79.02 Discuss VLAN basics and VLAN types.
	79.03 Configure a VLAN in a lab setting.
	79.04 Show use of VLAN identification techniques and VLAN trunking protocol.
	79.05 Create VTP configuration and use VTP pruning.
80.0	Understand and explain spanning tree protocol (STP) and redundant links. – The student will be able to:
	80.01 Discuss Basic STP Operations and STP Processes.
	80.02 Compare and contrast VLANs and STP.
	80.03 Show how STP is used in the Campus Network.
	80.04 Demonstrate the resolution of Redundant Links.
81.0	Demonstrate proficiency with multilayer switching. – The student will be able to:
	81.01 Define and explain MLS Processes.
	81.02 Create basic MLS configurations.
	81.03 Show proficiency using flow masks.
82.0	Demonstrate the use of hot standby routing protocol (HSRP). – The student will be able to:
	82.01 Define and explain HSRP operations.
	82.02 Create HSRP configurations in a lab setting.
83.0	Understand and use IGMP and multicasting. – The student will be able to:
	83.01 Define and explain multicasting.
	83.02 Understand and discuss IGMP.
	83.03 Show proficiency routing multicast traffic.
	83.04 Demonstrate proficiency using multicast routing protocols.
	83.05 Configure IP multicast routing in a lab setting.

	83.06 List and describe optional IP multicast routing tasks.
84.0	Demonstrate proficiency restricting network access. – The student will be able to:
	84.01 Show proficiency creating networking policies.
	84.02 Discuss and explain basic network security techniques.
	84.03 Demonstrate execution of policy configurations on a set of routers.
85.0	Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools. – The student will be able to:
	85.01 Explain and discuss troubleshooting methodologies and general problem-solving concepts.
	85.02 List and define general considerations in troubleshooting.
	85.03 Define and explain each component of the general problem-solving model.
	85.04 Demonstrate proficiency using common management and diagnostic tools.
	85.05 Show proficiency using network management software.
	85.06 Demonstrate proficiency using router diagnostic commands.
	85.07 Familiarize logging and error message formats.
	85.08 Demonstrate proficiency interacting with technical support.
86.0	List and define the commonly used protocols, routing techniques, and switching processes. – The student will be able to:
	86.01 List and define network services, layer 2 LAN protocols, and layer 2 WAN protocols.
	86.02 Trace packets through a router.
	86.03 Define and explain packet switching paths.
	86.04 Identify performance issues affecting packet switching.
	86.05 Define and explain low-level troubleshooting.
87.0	Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANS and frame relay. – The student will able to:
	87.01 List, define, and explain theory, concepts, and terminology of TCP/IP, LAN switch environment, spanning tree, VLANs and frame relay.
	87.02 List, define, and explain common problems with TCP/IP and LAN switching.
	87.03 List, define, and explain common scenarios with VLANs and frame relay.

87.04	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.
87.05	Use show commands to verify LAN switch configuration settings.
87.06	Use show and debug commands for TCP/IP, router VLANs and frame relay.
87.07	Use TCP/IP diagnostic tools.

Course Number: CTS0029 **Occupational Completion Point: F** **Wireless Network Administrator– 150 Hours – SOC Code 15-1143**	
88.0	Participate in simulated work-based learning experiences. – The student will be able to:
88.01	Participate in simulated work-based learning experiences in a network support services environment.
88.02	Discuss the use of technology in a network support services environment.
88.03	Discuss the management/supervisory skills needed in a network support service environment.
89.0	Demonstrate proficiency in applying radio frequency (RF) technologies. – The student will be able to:
89.01	Define and apply the basic concepts of RF behavior.
89.02	Understand the applications of basic RF antenna concepts.
89.03	Understand and apply the basic components of RF.
89.04	Identify some of the different uses for spread spectrum technologies.
89.05	Comprehend the differences between, and apply the different types of spread spectrum technologies.
89.06	Identify and apply the concepts which make up the functionality of spread spectrum technology.
89.07	Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times.
90.0	Develop an awareness of wireless LAN technologies. – The student will be able to:
90.01	Identify and apply the processes involved in authentication and association.
90.02	Recognize the concepts associated with wireless LAN service sets.
90.03	Understand the implications of the following power management features of wireless LANs.
90.04	Specify the modes of operation involved in the movement of data traffic across wireless LANs.
91.0	Perform implementation and management activities. – The student will be able to:
91.01	Identify the technology roles for which wireless LAN technology is an appropriate technology application.
91.02	Identify the purpose of infrastructure devices and explain how to install, configure, and manage them.
91.03	Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them.

91.04	Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them.
91.05	Identify the basic attributes, purpose, and function of types of antennas.
91.06	Describe the proper locations and methods for installing antennas.
91.07	Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas.
91.08	Identify the use of wireless LAN accessories and explain how to install, configure, and manage them.
91.09	Identify, understand, correct or compensate for wireless LAN implementation challenges.
91.10	Explain how antenna diversity compensates for multipath.
91.11	Identify and understand the importance and process of conducting a thorough site survey.
91.12	Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey.
91.13	Identify the necessary equipment involved in performing a site survey.
91.14	Understand the necessary procedures involved in performing a site survey.
91.15	Identify and understand site survey reporting procedures.
92.0	Develop an awareness of wireless security systems. – The student will be able to:
92.01	Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques including the use of WVLAN's.
92.02	Describe types of wireless LAN security attacks, and explain how to identify and prevent them.
92.03	Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions.
92.04	Explain the uses of corporate security policies and how they are used to secure a wireless LAN.
92.05	Identify how and security precautions are used to secure a wireless LAN.
93.0	Demonstrate knowledge of wireless industry standards. – The student will be able to:
93.01	Identify, apply and comprehend the differences between wireless LAN standards.
93.02	Understand the roles of organizations in providing direction and accountability within the wireless LAN industry.
93.03	Identify the differences between the ISM and UNII bands.
93.04	Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links.

Course Number: EEV0317 **Occupational Completion Point: G** **Data Communications Analyst – 150 Hours – SOC Code 15-1143**	
94.0	Participate in simulated work-based learning experiences. – The student will be able to:
94.01	Participate in simulated work-based learning experiences in a network support services environment.
94.02	Discuss the use of technology in a network support services environment.
94.03	Discuss the management/supervisors skills needed in a network support services environment.
95.0	Demonstrate a knowledge of general security concepts. – The student will be able to:
95.01	Describe access control.
95.02	Describe network authentication.
95.03	Understand the various types of network attacks (backdoors, DOS, spoofing).
95.04	Identify and modify non-essential services and protocols.
95.05	Identify malicious code (virus, worm, Trojan).
95.06	Configure system auditing, logging, and scanning as it relates to security procedures.
96.0	Develop an awareness of communication security concepts. – The student will be able to:
96.01	Describe remote access protocols (VPN, RADIUS, L2TP).
96.02	Identify E-mail security concerns (hoaxes, spam).
96.03	Identify web (HTML) security concepts and designs (HTTP/S, IM).
96.04	Demonstrate an awareness of file transfer security concerns.
96.05	Describe and identify wireless networking security concerns and vulnerabilities.
97.0	Develop an awareness of network infrastructure security. – The student will be able to:
97.01	Install and configure network firewalls.
97.02	Identify security concerns with various wiring media (copper, fiber).
97.03	Identify security concerns associated with removable media and storage devices.
97.04	Demonstrate an awareness of security topologies (security zones, Intranets, NAT).

97.05	Configure and use intrusion detection software.
97.06	Establish security baselines (updates, patches, hot fixes, Access Control lists).
97.07	Demonstrate the ability to configure a Virtual Private Network (VPN).
97.08	Describe the function of Network Address Translation (NAT).
98.0	Develop an awareness of cryptography and its relation to security. – The student will be able to:
98.01	Demonstrate an understanding of security algorithms and encryption.
98.02	Use and apply Public Key Certificates.
98.03	Demonstrate an understanding of standards and protocols in commerce.
99.0	Incorporate organizational and operational security in an appropriate and effective manner. – The student will be able to:
99.01	Describe how to establish a network security policy.
99.02	Explain the importance of physical security to protect network resources.
99.03	Identify and use disaster recovery procedures.
99.04	Describe the importance of business continuity and its relationship to network and corporate security.
99.05	Describe security policies and procedures that would be used in a business environment.
99.06	Explain the importance of privilege management (access, password management, sign-on).
99.07	Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches).
99.08	Explain the importance of educating users and supervisors in regard to network security.
99.09	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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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

Career Certificate Program	
Program Number	B079300
CIP Number	0511090105
Grade Level	30, 31
Standard Length	1050 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists 15-1142 – Network and Computer Systems Administrators 15-1143 – Computer Network Architects
Basic Skills Level	Mathematics: 9 Language: 9 Reading: 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	SOC Code
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours	15-1151
B	EEV0504	Computer Support Assistant	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	150 hours	15-1151
C	CTS0026	Network Support Technician		150 hours	15-1142
D	CTS0027	Systems Administrator		150 hours	15-1142
E	CTS0028	Systems Engineer		150 hours	15-1143
F	CTS0029	Wireless Network Administrator		150 hours	15-1143
G	EEV0317	Data Communications Analyst		150 hours	15-1143

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 14.0 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 systems to accomplish job objectives and enhance workplace performance.
02.0 Develop an awareness of microprocessors and digital computers.
03.0 Demonstrate an understanding of operating systems.
04.0 Use technology to enhance the effectiveness of communication skills utilizing word processing applications.
05.0 Use technology to enhance communication skills utilizing presentation applications.
06.0 Use technology to enhance the effectiveness of communication utilizing spreadsheet and database applications.
07.0 Use technology to enhance communication skills utilizing electronic mail.
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 Demonstrate competence in page design applicable to the WWW.
12.0 Develop an awareness of emerging technologies.
13.0 Develop awareness of computer languages and software applications.
14.0 Demonstrate comprehension and communication skills.
15.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
16.0 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.
17.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment.
18.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace.
19.0 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.
20.0 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.
21.0 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.
22.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, email, remote access, or direct contact.
23.0 Demonstrate proficiency using graphical user interface (GUI) operating systems.

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

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

100.0 Implement placement of domain controllers.
101.0 Use a framework for designing security and create a security design team.
102.0 Recognize and predict common threats by using a threat model.
103.0 Apply a framework for planning risk management.
104.0 Design security for physical resources.
105.0 Design security for computers.
106.0 Design security for accounts.
107.0 Design security for authentication.
108.0 Design security for data.
109.0 Design security for data transmission.
110.0 Design security for network perimeter.
111.0 Design an audit policy and an incident response procedure.
112.0 Linux Foundation.
113.0 Linux Fundamentals.
114.0 Linux Installation.
115.0 Linux Operation.
116.0 Linux user Group and Permissions.
117.0 Linux Basic Security & System Monitoring.
118.0 Participate in work-based learning experiences.
119.0 Demonstrate proficiency in applying radio frequency (RF) technologies.
120.0 Develop an awareness of wireless LAN technologies.
121.0 Perform implementation and management activities.
122.0 Develop an awareness of wireless security systems.
123.0 Demonstrate knowledge of wireless industry standards.
124.0 Participate in work-based learning experiences.
125.0 Demonstrate knowledge of general security concepts.
126.0 Develop an awareness of communication security concepts.
127.0 Develop an awareness of network infrastructure security.
128.0 Develop an awareness of cryptography and its relation to security.
129.0 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 – SOC Code 15-1151**
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 – 14.0) have been placed in a separate document.

Course Number: EEV0504 **Occupational Completion Point: B** **Computer Support Assistant – 150 Hours – SOC Code 15-1151**	
15.0	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:
15.01	Develop strategies for resolving customer conflicts.
16.0	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:
16.01	Identify and describe the functions of main processing boards.
16.02	Identify and describe the functions of communication ports.
16.03	Identify and describe the functions of peripheral devices.
16.04	Identify and describe the components of portable systems.
16.05	Troubleshoot, install and upgrade computers and peripherals.
16.06	Perform system hardware setup.
16.07	Demonstrate an understanding of input/output devices.
16.08	Installation and configuration of applications software, hardware, and device drivers.
16.09	Demonstrate an understanding of the operation and purpose of hardware components.
16.10	Install operating system software.
16.11	Customize operating systems.
16.12	Install application software.
16.13	Perform storage formatting and preparation activities.
16.14	Identify data measurement.
16.15	Install and configure RAID.
16.16	Recognize and report on server room environmental issues.
17.0	Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. – The student will be able to:
17.01	Troubleshoot a personal computer system.
17.02	Identify configuration problems.

	17.03 Identify software problems.
	17.04 Identify hardware malfunctions.
	17.05 Identify network malfunctions.
	17.06 Resolve computer error messages.
	17.07 Understand and troubleshoot memory and cache systems.
	17.08 Verify that drives are the appropriate type.
	17.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.
18.0	Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. – The student will be able to:
	18.01 Apply basic rules for hardware safety.
	18.02 Demonstrate proficiency in basic preventative hardware maintenance.
	18.03 Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
	18.04 Apply ergonomic principles applicable to the configuration of computer workstations.
	18.05 Describe ethical issues and problems associated with computers and information systems**.**
19.0	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:
	19.01 Identify Random Access Memory (RAM) types.
	19.02 Identify I/O ports and devices.
20.0	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:
	20.01 Identify types of printers.
	20.02 Identify care and service techniques and common problems with primary printer types.
	20.03 Implement and manage printing on a network.
21.0	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:
	21.01 Define networking and describe the purpose of a network.
	21.02 Identify the purposes and interrelationships among the major components of networks.
	21.03 Describe the various types of network topologies.

	21.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
	21.05 Configure network and verify network connectivity.
	21.06 Discuss the responsibilities of the network.
	21.07 Develop user logon procedures.
	21.08 Utilize network management infrastructures to perform administrative tasks.
	21.09 Identify common backup strategies and procedures.
	21.10 Select and use appropriate electronic communications software and hardware for specific tasks.
	21.11 Compare and contrast Internet software and protocols.
	21.12 Diagnose and resolve electronic communications operational problems.
	21.13 Design and implement directory tree structures.
	21.14 Install services tools.
	21.15 Perform and verify backups.
	21.16 Identify bottlenecks.
	21.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
	21.18 Document and test disaster recovery plan regularly, and update as needed.
22.0	Perform end user support and assistance by troubleshooting and diagnosing through verbal or written communication. – The student will be able to:
	22.01 Apply call center vocabulary.
	22.02 Listen and input information simultaneously.
	22.03 Apply first response assistance for minor repair work.
23.0	Demonstrate proficiency using graphical user interface (GUI) operating systems. – The student will be able to:
	23.01 Identify parts of GUI windows.
	23.02 Demonstrate proficiency in using menu systems.
	23.03 Demonstrate proficiency in using pointing and selection devices.
	23.04 Identify keyboard shortcuts and special function keys.
	23.05 Demonstrate proficiency in manipulating windows.

23.06 Utilize help systems and hypertext links.
23.07 Create, organize, and maintain file system directories.
23.08 Organize desktop objects.
23.09 Run multiple applications.

Course Number: CTS0026 **Occupational Completion Point: C** **Network Support Technician – 150 Hours – SOC Code 15-1142**	
24.0	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:
24.01	Develop diplomatic methods to communicate with customers.
25.0	Participate in work-based learning experiences. – The student will be able to:
25.01	Participate in work-based learning experiences in a network support services environment.
25.02	Discuss the use of technology in a network environment.
26.0	Perform end user support and assistance by troubleshooting and diagnosing through telephone, email, remote access, or direct contact. – The student will be able to:
26.01	Apply first response assistance for minor repair work.
27.0	Perform installation and configuration activities. – The student will be able to:
27.01	Configure the operating system environment.
27.02	Connect client workstation running similar operating system to the network.
27.03	Configure Internet access for a network.
27.04	Configure a web server.
27.05	Use remote server to deploy operating system.
27.06	Troubleshoot failed installations.
27.07	Install and configure network services for interoperability.
27.08	Monitor, configure troubleshoot and control access to printers.
27.09	Monitor, configure troubleshoot and control access to files, folders, and shared folders.
27.10	Monitor, configure troubleshoot and control access to websites.
28.0	Demonstrate proficiency using computer networks. – The student will be able to:
28.01	Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.

29.0	Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers. – The student will be able to:
	29.01 Configure hardware devices.
	29.02 Configure driver signing options.
	29.03 Update device drivers.
	29.04 Troubleshoot problems with hardware.
30.0	Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability. – The student will be able to:
	30.01 Monitor and optimize usage of system resources.
	30.02 Manage processes.
	30.03 Optimize disk performance.
	30.04 Manage and optimize availability of system data and user data.
	30.05 Recover systems and user data.
31.0	Demonstrate proficiency in managing, configuring and troubleshooting storage use. – The student will be able to:
	31.01 Configure and manage user profiles.
	31.02 Monitor, configure and troubleshoot disks and volumes.
	31.03 Configure data compression.
	31.04 Monitor and configure disk quotas.
	31.05 Recover from disk failures.
32.0	Demonstrate proficiency in configuring and troubleshooting network connections. – The student will be able to:
	32.01 Install, configure and troubleshoot shared access.
	32.02 Install, configure and troubleshoot a virtual private network.
	32.03 Install, configure and troubleshoot network protocols.
	32.04 Install and configure network services.

	32.05 Configure, monitor and troubleshoot remote access.
	32.06 Install, configure, monitor, and troubleshoot Terminal Services.
	32.07 Configure the properties of a connection.
	32.08 Install, configure, and troubleshoot network adapters and drivers.
33.0	Demonstrate proficiency in implementing, monitoring, and troubleshooting security. – The student will be able to:
	33.01 Encrypt data on a hard disk by using Encrypting File System.
	33.02 Implement, configure, manage and troubleshoot policies in an operating system environment.
	33.03 Implement, configure, manage and troubleshoot auditing.
	33.04 Implement, configure, manage and troubleshoot local accounts.
	33.05 Implement, configure, manage and troubleshoot account policy.
	33.06 Implement, configure, manage and troubleshoot security by using the Security Configuration Tool Set.
34.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas. – The student will be able to:
	34.01 Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.
	34.02 Locate, organize and reference written information from various sources.
	34.03 Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.
	34.04 Interpret verbal and nonverbal cues/behaviors that enhance communication.
	34.05 Apply active listening skills to obtain and clarify information.
	34.06 Develop and interpret tables and charts to support written and oral communications.
	34.07 Exhibit public relations skills that aid in achieving customer satisfaction.
35.0	Solve problems using critical thinking skills, creativity and innovation. – The student will be able to:
	35.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.
	35.02 Employ critical thinking and interpersonal skills to resolve conflicts.

	35.03 Identify and document workplace performance goals and monitor progress toward those goals.
	35.04 Conduct technical research to gather information necessary for decision-making.
36.0	Use information technology tools. – The student will be able to:
	36.01 Use personal information management (PIM) applications to increase workplace efficiency.
	36.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.
	36.03 Employ computer operations applications to access, create, manage, integrate, and store information.
	36.04 Employ collaborative/groupware applications to facilitate group work.
37.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. – The student will be able to:
	37.01 Describe the nature and types of business organizations.
	37.02 Explain the effect of key organizational systems on performance and quality.
	37.03 List and describe quality control systems and/or practices common to the workplace.
	37.04 Explain the impact of the global economy on business organizations.
38.0	Describe the importance of professional ethics and legal responsibilities. – The student will be able to:
	38.01 Evaluate and justify decisions based on ethical reasoning.
	38.02 Evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities, and employer policies.
	38.03 Identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace.
	38.04 Interpret and explain written organizational policies and procedures.

Course Number: CTS0027 **Occupational Completion Point: D** **Systems Administrator – 150 Hours – SOC Code 15-1142**	
39.0	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:
	39.01 Develop diplomatic methods to communicate with customers, clients, and end-users of information technology services.
40.0	Participate in work-based learning experiences. – The student will be able to:
	40.01 Participate in work-based learning experiences in a network support services environment.
	40.02 Discuss the use of technology in a network support services environment.
	40.03 Discuss the management/supervisors skills needed in a network support services environment.
41.0	Administer accounts and resources on computers running server operating system software in a networked environment. – The student will be able to:
	41.01 Describe features of server operating system.
	41.02 Log on to the server operating system.
	41.03 Install and configure administrative tools.
	41.04 Create user accounts.
	41.05 Create computer accounts.
	41.06 Create an organizational unit.
42.0	Modify user and computer accounts on computers running a server operating system in a networked environment. – The student will be able to:
	42.01 Modify user and computer account properties.
	42.02 Enable and unlock user and computer accounts.
	42.03 Create a user account template.
	42.04 Locate user and computer accounts in a global directory structure.
	42.05 Save queries.
	42.06 Reset user and computer accounts.
	42.07 Move domain objects.

43.0	Perform various administrative functions using groups. – The student will be able to:
	43.01 Create groups.
	43.02 Manage group membership.
	43.03 Apply strategies for using groups.
	43.04 Modify groups.
	43.05 Manage default groups.
44.0	Enable resource access with permissions, manage access to files and folders using permissions, and manage permission inheritance. – The student will be able to:
	44.01 Manage access to resources.
	44.02 Manage access to shared folders.
	44.03 Manage access to files and folders by using file system permissions.
	44.04 Determine effective permissions.
	44.05 Manage access to shared files by using offline caching.
45.0	Implement printing in a networked environment utilizing a particular server operating system. – The student will be able to:
	45.01 Install and share printers.
	45.02 Manage access to printers by using shared printer permissions.
	45.03 Manage printer drivers.
	45.04 Implement printer locations.
	45.05 Change the location of the print spooler.
	45.06 Set printing priorities.
	45.07 Schedule printer availability.
	45.08 Configure a printing tool.
46.0	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:
	46.01 Identify the role of organizational units.
	46.02 Modify permissions for global directory objects.

	46.03 Delegate control of organizational units.
47.0	Use group policy to configure folder redirection, browser connectivity, and the desktop. – The student will be able to:
	47.01 Configure group policy settings.
	47.02 Assign scripts with group policy.
	47.03 Configure folder redirection.
48.0	Manage computer security in a security in a networking environment. – The student will be able to:
	48.01 Describe the security features a server operating system.
	48.02 Use security templates to secure computers.
	48.03 Test computer security policy.
	48.04 Configure auditing.
	48.05 Manage security logs.
49.0	Administer servers remotely. – The student will be able to:
	49.01 Explain the tasks, tools, and rights that are required to administer a server.
	49.02 Configure remote access for administration and client preferences.
	49.03 Manage remote desktop connections.
50.0	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:
	50.01 Establish a performance baseline.
	50.02 Perform real-time and logged monitoring.
	50.03 Configure and manage counter logs.
	50.04 Configure alerts.
51.0	Collect performance data by monitoring primary server subsystems and identify system bottlenecks by using the performance monitoring software. – The student will be able to:
	51.01 Explain how the four primary server subsystems affect server performance.
	51.02 Monitor server memory.
	51.03 Monitor processor usage.

	51.04 Monitor disks.
	51.05 Monitor network usage.
	51.06 Identify the guidelines for using counters and thresholds.
	51.07 Describe the best practices for monitoring server performance.
52.0	Maintain device drivers. – The student will be able to:
	52.01 Configure device driver signing.
	52.02 Restore the previous version of a device driver.
53.0	Use software tools to manage and set up disks. – The student will be able to:
	53.01 Initialize and partition a disk.
	53.02 View and update disk properties.
	53.03 Manage mounted drives.
	53.04 Create volumes on a disk.
	53.05 Convert a disk from basic to dynamic and from dynamic to basic.
	53.06 Import disks.
54.0	Use file encryption for security of data. – The student will be able to:
	54.01 Manage disk based file compression.
	54.02 Configure file encryption.
	54.03 Implement disk quotas.
55.0	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:
	55.01 Prepare for disaster recovery.
	55.02 Back up data.
	55.03 Schedule backup jobs.
	55.04 Restore data.
	55.05 Configure a shadow copy.

	55.06 Recover from server failure.
	55.07 Select a disaster recovery method.
56.0	Manage and distribute critical software updates that resolve known security vulnerabilities and other stability issues. – The student will be able to:
	56.01 Install and configure client computers to use receive software updates.
	56.02 Install and configure servers to use perform software updates.
	56.03 Manage the Software Update Services infrastructure.
57.0	Construct and assign IP addresses and isolate addressing issues associated with the IP routing process. – The student will be able to:
	57.01 Convert IP Addresses from decimal to binary.
	57.02 Calculate a subnet mask.
	57.03 Create subnets using VLSM and CIDR.
	57.04 Isolate addressing issues associated with the IP routing process.
58.0	Configure an internet protocol (IP) address for client computers. – The student will be able to:
	58.01 Configure a client to use a static IP address.
	58.02 Configure a client to obtain an IP address automatically by using DHCP.
	58.03 Configure a client to obtain an IP address automatically by using Alternate Configuration.
59.0	Configure name resolution mechanisms for clients on a network and describe the name resolution process. – The student will be able to:
	59.01 Use ARP to identify client media access control (MAC) addresses.
	59.02 Describe the function of Network Basic Input/Output System (NetBIOS).
	59.03 Configure a client to use a static IP address.
	59.04 Configure a client to use name resolution servers.
60.0	Isolate common connectivity issues and describe how to use utilities and tools as part of this process. – The student will be able to:
	60.01 Isolate common connectivity issues.
	60.02 Use a flow chart to isolate a problem.
	60.03 Use utilities and tools to isolate a problem.

61.0	Configure a routing solution for a network environment. – The student will be able to:
	61.01 Describe the role of routing in the network infrastructure.
	61.02 Enable and configure the Routing and Remote Access service.
	61.03 Configure packet filters.
62.0	Allocate IP addressing in a network environment. – The student will be able to:
	62.01 Describe the role of DHCP in the network infrastructure.
	62.02 Add and authorize a DHCP Server service.
	62.03 Configure a DHCP scope.
	62.04 Configure DHCP options.
	62.05 Configure a DHCP reservation.
	62.06 Configure a DHCP relay agent.
63.0	Manage the DHCP service to reflect changing client IP addressing needs and monitor DHCP server performance. – The student will be able to:
	63.01 Manage a DHCP database.
	63.02 Monitor DHCP.
	63.03 Apply security guidelines for DHCP.
64.0	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:
	64.01 Describe the name resolution process.
	64.02 View names on a client.
	64.03 Configure host name resolution.
65.0	Resolve host names by using domain name system. – The student will be able to:
	65.01 Describe the role of DNS in the network infrastructure.
	65.02 Install the DNS Server service.
	65.03 Configure the properties for the DNS Server service.
	65.04 Configure the DNS zones.

	65.05 Configure DNS zone transfers.
	65.06 Configure dynamic updates.
	65.07 Configure a DNS client.
	65.08 Delegate authority for zones.
66.0	Manage and monitor DNS servers to ensure that they are functioning properly and to optimize network performance. – The student will be able to:
	66.01 Configure the Time-to-Live (TTL) value.
	66.02 Configure aging and scavenging.
	66.03 Integrate DNS with WINS.
	66.04 Test the DNS server configuration.
	66.05 Monitor DNS server performance.
67.0	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:
	67.01 Describe a network access infrastructure.
	67.02 Configure a virtual private network (VPN) connection.
	67.03 Configure a dial-up connection.
	67.04 Configure a wireless connection.
	67.05 Control remote user access to a network.
	67.06 Centralize authentication and policy management for network access by using Internet Authentication Service (IAS).
68.0	Manage and monitor network access and the network access services. – The student will be able to:
	68.01 Configure logging on the network access server.
	68.02 Collect and monitor network access data.
69.0	Perform installation of a network client operating system. – The student will be able to:
	69.01 Plan a client operating system installation.
	69.02 Install a client operating system.
	69.03 Upgrade a client operating system from an earlier version.

	69.04 Automate the installation process for a client operating system.
70.0	Install and configure hardware devices. – The student will be able to:
	70.01 Configure hardware devices and drivers on a computer running a client OS.
	70.02 Add and remove devices by using built in utilities and wizards.
	70.03 Restore device drivers.
71.0	Configure and manage file systems. – The student will be able to:
	71.01 Work with file systems.
	71.02 Manage data compression.
	71.03 Secure data by using EFS.
	71.04 Configure disk compression.
	71.05 Secure files by using EFS.
72.0	Troubleshoot the boot process and other system issues. – The student will be able to:
	72.01 Examine the boot process.
	72.02 Control system settings during the boot process.
	72.03 Change startup behavior.
	72.04 Use advanced boot options to troubleshoot startup problems.
	72.05 Restore a computer to a previous state.
	72.06 Troubleshoot the boot process and other system issues.
73.0	Configure the desktop. – The student will be able to:
	73.01 Configure user desktop settings.
	73.02 Customize the desktop environment.
	73.03 Configure system settings.
	73.04 Describe how user profiles and group policy affect desktop customization.
74.0	Configure IP addresses and name resolution. – The student will be able to:

	74.01 Configure IP addresses.
	74.02 Troubleshoot IP addresses.
	74.03 Determine TCP/IP name resolution methods.
	74.04 Configure a DNS and WINS client.
	74.05 Connect to a remote host.
	74.06 Configure IP addresses.
	74.07 Configure the DNS client.
75.0	Configure the client to work in a network environment. – The student will be able to:
	75.01 Examine workgroups and user accounts.
	75.02 Create and authenticate local user accounts.
	75.03 Configure local security.
	75.04 Configure logon options.
	75.05 Configure networking.
	75.06 Join a domain.
	75.07 Operate in a domain.
76.0	Support remote users. – The student will be able to:
	76.01 Establish remote access connections.
	76.02 Connect to Virtual Private Networks.
	76.03 Configure inbound connections.
	76.04 Configure authentication protocols and encryption.
	76.05 Using remote desktop.
	76.06 Store user names and passwords to facilitate remote connections.
	76.07 Configure a VPN connection.
	76.08 Configure and using remote desktop.

	76.09 Store user names and passwords.
77.0	Configure a client OS for mobile computing. – The student will be able to:
	77.01 Configure hardware for mobile computing.
	77.02 Configure power management options for mobile computing.
	77.03 Make files, folders, and webpages available for offline use.
78.0	Monitor resources and performance. – The student will be able to:
	78.01 Determine system information.
	78.02 Use task manager to monitor system performance.
	78.03 Use performance and maintenance tools to improve performance.
	78.04 Monitor event logs.
	78.05 Configure program compatibility.
79.0	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:
	79.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.
	79.02 Explain emergency procedures to follow in response to workplace accidents.
	79.03 Create a disaster and/or emergency response plan.
80.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives. – The student will be able to:
	80.01 Employ leadership skills to accomplish organizational goals and objectives.
	80.02 Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.
	80.03 Conduct and participate in meetings to accomplish work tasks.
	80.04 Employ mentoring skills to inspire and teach others.
81.0	Explain the importance of employability skill and entrepreneurship skills. – The student will be able to:
	81.01 Identify and demonstrate positive work behaviors needed to be employable.
	81.02 Develop personal career plan that includes goals, objectives, and strategies.
	81.03 Examine licensing, certification, and industry credentialing requirements.

81.04	Maintain a career portfolio to document knowledge, skills, and experience.
81.05	Evaluate and compare employment opportunities that match career goals.
81.06	Identify and exhibit traits for retaining employment.
81.07	Identify opportunities and research requirements for career advancement.
81.08	Research the benefits of ongoing professional development.
81.09	Examine and describe entrepreneurship opportunities as a career planning option.
81.10	Research, compare and contrast investment opportunities.

Course Number: CTS0028 **Occupational Completion Point: E** **Systems Engineer – 150 Hours – SOC Code 15-1143**	
82.0	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:
	82.01 Communicate technical information in a concise, understandable manner to a non-technical audience both verbally and in writing.
83.0	Participate in work-based learning experiences. – The student will be able to:
	83.01 Participate in 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 Compare and contrast the software applications used in a network support services environment.
84.0	Plan a network infrastructure. – The student will be able to:
	84.01 Explain how to plan a network.
	84.02 Explain how to prepare development and test environments.
	84.03 Explain the concepts of managing and maintaining a network environment by using specific tools.
	84.04 Explain the technologies and services implemented in a network.
85.0	Plan and optimize a TCP/IP physical and logical network. – The student will be able to:
	85.01 Discuss TCP/IP.
	85.02 Plan a TCP/IP addressing scheme.
	85.03 Optimize network performance.
86.0	Plan and troubleshoot routing. – The student will be able to:
	86.01 Describe how routing works.
	86.02 Create a secure routing plan.
	86.03 Identify TCP/IP routing trouble shooting tools.
	86.04 Troubleshoot TCP/IP routing.
87.0	Plan a DHCP strategy. – The student will be able to:
	87.01 Demonstrate how DHCP operates in an enterprise environment.

	87.02 Plan a DHCP strategy.
	87.03 Secure a DHCP strategy.
88.0	Plan a DNS strategy. – The student will be able to:
	88.01 Plan a namespace strategy.
	88.02 Plan zones.
	88.03 Plan zone replication.
	88.04 Plan a DNS server implementation.
89.0	Optimize and troubleshoot DNS. – The student will be able to:
	89.01 Optimize a DNS server.
	89.02 Optimize the DNS server-to-server communications.
	89.03 Optimize DNS client support traffic.
	89.04 Troubleshoot host name resolution.
90.0	Plan and troubleshoot IPSEC. – The student will be able to:
	90.01 Discuss IPSec.
	90.02 Understand IPSec default policies, rules, and settings.
	90.03 Plan IPSec deployment.
	90.04 Troubleshoot IPSec.
91.0	Plan a network access. – The student will be able to:
	91.01 Select appropriate connection methods for a network access strategy.
	91.02 Select a remote access policy strategy.
	91.03 Select a network access authentication method.
	91.04 Plan a network access strategy.
92.0	Troubleshoot network access. – The student will be able to:
	92.01 Identify network access troubleshooting resources.

	92.02 Troubleshoot network authentication.
	92.03 Troubleshoot LAN authentication.
	92.04 Troubleshoot remote access.
93.0	Analyze global director infrastructure. – The student will be able to:
	93.01 Describe the architecture of global directory.
	93.02 Describe the working of global directory.
	93.03 Use administrative tools to examine the components of global directory.
	93.04 Describe the global directory design, planning, and implementation processes.
94.0	Implement a global directory structure and domain structure. – The student will be able to:
	94.01 Create a forest and domain structure.
	94.02 Configure DNS in a global directory environment.
	94.03 Raise the functional level of a forest and a domain.
	94.04 Create trust relationships between domains.
	94.05 Secure trusts by using SID filtering.
95.0	Implement an organizational unit structure. – The student will be able to:
	95.01 Create an organizational unit.
	95.02 Delegate control for an organizational unit.
	95.03 Plan an organization unit strategy.
96.0	Implement user, group, and computer accounts. – The student will be able to:
	96.01 Describe the types of global directory accounts and groups.
	96.02 Create multiple user and computer accounts.
	96.03 Implement UPN suffixes.
	96.04 Move objects within a domain and across domains in a global structure.
	96.05 Plan a strategy for user computer and group accounts.

	96.06 Plan a global directory audit strategy.
97.0	Implement group policy. – The student will be able to:
	97.01 Create and configure group policy objects.
	97.02 Manage group policy objects.
	97.03 Verify and troubleshoot group policies.
	97.04 Delegate administrative control of group policies.
	97.05 Plan a group policies strategy for the enterprise.
98.0	Deploy and manage software by using group policies. – The student will be able to:
	98.01 Explain the basic concepts of software deployment by using group policies.
	98.02 Deploy software by using group policies.
	98.03 Configure software deployment by using group policies.
	98.04 Maintain deployed software by using group policies.
	98.05 Troubleshoot some common problems with software deployment.
	98.06 Plan a software deployment strategy.
99.0	Implement sites to manage global directory replication. – The student will be able to:
	99.01 Explain the components and the process of replication.
	99.02 Create and configure sites.
	99.03 Manage a global directory site topology.
	99.04 Monitor and troubleshoot global directory replication failures.
	99.05 Plan a site strategy.
100.0	Implement placement of domain controllers. – The student will be able to:
	100.01 Implement a global catalog in a global directory.
	100.02 Determine the placement of domain controllers in a global directory.
	100.03 Create a plan for placing domain controllers in a global directory.

101.0	Use a framework for designing security and create a security design team. – The student will be able to:
101.01	Describe common elements of security policies and procedures.
101.02	Create a security design framework.
101.03	Create a security design team.
102.0	Recognize and predict common threats by using a threat model. – The student will be able to:
102.01	Explain common network vulnerabilities and how attackers can exploit them.
102.02	Predict threats to security by using the STRIDE (Spoofing, Tampering, Repudiation, Information disclosure, Denial of service, Elevation of privilege) threat model.
103.0	Apply a framework for planning risk management. – The student will be able to:
103.01	Explain the purpose and operation of risk management.
103.02	Draft the elements of a risk management plan.
104.0	Design security for physical resources. – The student will be able to:
104.01	Determine threats and analyze risks to physical resources.
104.02	Design security for physical resources.
105.0	Design security for computers. – The student will be able to:
105.01	Determine threats and analyze risks to computers.
105.02	Design security for computers.
106.0	Design security for accounts. – The student will be able to:
106.01	Determine threats and analyze risks to accounts.
106.02	Design security for accounts.
107.0	Design security for authentication. – The student will be able to:
107.01	Determine threats and analyze risks to authentication.
107.02	Design security for authentication.
108.0	Design security for data. – The student will be able to:
108.01	Determine threats and analyze risks to data.

	108.02 Design security for data.
109.0	Design security for data transmission. – The student will be able to:
	109.01 Determine threats and analyze risks to data transmission.
	109.02 Design security for data transmission.
110.0	Design security for network perimeters. – The student will be able to:
	110.01 Determine threats and analyze risks to network perimeters.
	110.02 Design security for network perimeters.
111.0	Design an audit policy and an incident response procedure. – The student will be able to:
	111.01 Explain the importance of auditing and incident response.
	111.02 Design an auditing policy.
	111.03 Design an incident response procedure.
112.0	Linux Foundation. – The student will be able to:
	112.01 Explain the creation history of Linux.
	112.02 Explain Free and Open Source Software (FOSS).
	112.03 Explain the concept of a GNU General Public License (GPL).
	112.04 Explain the concept of a Linux distribution and name some well-known distributions.
	112.05 Site common uses of Linux and it's roles in global networks.
113.0	Linux Fundamentals. – The student will be able to:
	113.01 Access and utilize the command line interface shell.
	113.02 Explain the purpose of and demonstrate the use of the super user and super user do (sudo) command.
	113.03 Know where to get help and how to use the manual (man) pages.
	113.04 Use non-graphical text editors such as vi and nano.
	113.05 Use and create command aliases.
	113.06 Adjust environmental variables and shell configuration files.

113.07 Demonstrate redirection, piping, standard input, standard output, & standard error.
113.08 Work with Directories, links, and files.
113.09 Describe the most common Filesystem Hierarchy Standard (FHS).
113.10 Compress and decompress files using standard Linux utilities.
114.0 Linux Installation. – The student will be able to:
114.01 Plan and perform a Linux installation including harddrive partitioning, Logical Volumes (LV), and basic Logical Volume Management (LVM) operation.
114.02 Install various distributions of Linux in server and client modes.
114.03 Explain the boot loader and describe the most common boot loader, GRUB2.
115.0 Linux System Operation. – The student will be able to:
115.01 Start, display, and kill running processes.
115.02 Explain the purpose of the Process ID (PID).
115.03 Explain the relationship of parent, child, and zombie processes.
115.04 Explain the role of systemd.
115.05 Update and upgrade running Linux systems.
115.06 Describe the use of shared libraries.
115.07 Mount volumes.
116.0 Linux Users Groups and Permissions. – The student will be able to:
116.01 Display existing groups and users.
116.02 Create users.
116.03 Explain the use of the shadow password file.
116.04 Create groups.
116.05 Assign users to groups.
116.06 Explain how Linux uses file and folder ownership and group permissions.
116.07 Change ownership and group ownership of files and folders.

116.08	Explain the attributes read, write, execute (rwx).
116.09	Demonstrate the ability to change attributes using the single, multiple, and binary methods.
116.10	Describe the use of special permissions.
117.0	Linux Basic Security & System Monitoring. – The student will be able to:
117.01	Configure network interfaces for IPv4 and IPv6.
117.02	Display iptables and create a new firewall rule.
117.03	Demonstrate the ability to read and manipulate system & security log files using head, tail, cat, less, and more.
117.04	Demonstrate the ability to backup system & security logs.
117.05	Create basic scripts to automate tasks.
117.06	Block logins, disable, and re-enable accounts.
117.07	Remove un-needed services and disable unused ports.

Course Number: CTS0029 **Occupational Completion Point: F** **Wireless Network Administrator – 150 Hours – SOC Code 15-1143**
118.0 Participate in simulated work-based learning experiences. – The student will be able to:
118.01 Participate in simulated work-based learning experiences in a network support services environment.
118.02 Discuss the use of technology in a network support services environment.
118.03 Discuss the management/supervisory skills needed in a network support service environment.
119.0 Demonstrate proficiency in applying radio frequency (RF) technologies. – The student will be able to:
119.01 Define and apply the basic concepts of RF behavior.
119.02 Understand the applications of basic RF antenna concepts.
119.03 Understand and apply the basic components of RF.
119.04 Identify some of the different uses for spread spectrum technologies.
119.05 Comprehend the differences between, and apply the different types of spread spectrum technologies.
119.06 Identify and apply the concepts which make up the functionality of spread spectrum technology.
119.07 Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times.
120.0 Develop an awareness of wireless LAN technologies. – The student will be able to:
120.01 Identify and apply the processes involved in authentication and association.
120.02 Recognize the concepts associated with wireless LAN service sets.
120.03 Understand the implications of the following power management features of wireless LANs.
120.04 Specify the modes of operation involved in the movement of data traffic across wireless LANs.
121.0 Perform implementation and management activities. – The student will be able to:
121.01 Identify the technology roles for which wireless LAN technology is an appropriate technology application.
121.02 Identify the purpose of infrastructure devices and explain how to install, configure, and manage them.
121.03 Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them.
121.04 Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them.

121.05	Identify the basic attributes, purpose, and function of types of antennas.
121.06	Describe the proper locations and methods for installing antennas.
121.07	Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas.
121.08	Identify the use of wireless LAN accessories and explain how to install, configure, and manage them.
121.09	Identify, understand, correct or compensate for wireless LAN implementation challenges.
121.10	Explain how antenna diversity compensates for multipath.
121.11	Identify and understand the importance and process of conducting a thorough site survey.
121.12	Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey.
121.13	Identify the necessary equipment involved in performing a site survey.
121.14	Understand the necessary procedures involved in performing a site survey.
121.15	Identify and understand site survey reporting procedures.
122.0	Develop an awareness of wireless security systems. – The student will be able to:
122.01	Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques including the use of WVLAN's.
122.02	Describe types of wireless LAN security attacks, and explain how to identify and prevent them.
122.03	Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions.
122.04	Explain the uses of corporate security policies and how they are used to secure a wireless LAN.
122.05	Identify how and security precautions are used to secure a wireless LAN.
123.0	Demonstrate knowledge of wireless industry standards. – The student will be able to:
123.01	Identify, apply and comprehend the differences between wireless LAN standards.
123.02	Understand the roles of organizations in providing direction and accountability within the wireless LAN industry.
123.03	Identify the differences between the ISM and UNII bands.
123.04	Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links.

Course Number: EEV0317 **Occupational Completion Point: G** **Data Communications Analyst – 150 Hours – SOC Code 15-1143**
124.0 Participate in simulated work-based learning experiences. – The student will be able to:
124.01 Participate in simulated work-based learning experiences in a network support services environment.
124.02 Discuss the use of technology in a network support services environment.
124.03 Discuss the management/supervisors skills needed in a network support services environment.
125.0 Demonstrate a knowledge of general security concepts. – The student will be able to:
125.01 Describe access control.
125.02 Describe network authentication.
125.03 Understand the various types of network attacks (backdoors, DOS, spoofing).
125.04 Identify and modify non-essential services and protocols.
125.05 Identify malicious code (virus, worm, Trojan).
125.06 Configure system auditing, logging, and scanning as it relates to security procedures.
126.0 Develop an awareness of communication security concepts. – The student will be able to:
126.01 Describe remote access protocols (VPN, RADIUS, L2TP).
126.02 Identify E-mail security concerns (hoaxes, spam).
126.03 Identify web (HTML) security concepts and designs (HTTP/S, IM).
126.04 Demonstrate an awareness of file transfer security concerns.
126.05 Describe and identify wireless networking security concerns and vulnerabilities.
127.0 Develop an awareness of network infrastructure security. – The student will be able to:
127.01 Install and configure network firewalls.
127.02 Identify security concerns with various wiring media (copper, fiber).
127.03 Identify security concerns associated with removable media and storage devices.
127.04 Demonstrate an awareness of security topologies (security zones, Intranets, NAT).

	127.05 Configure and use intrusion detection software.
	127.06 Establish security baselines (updates, patches, hot fixes, Access Control lists).
	127.07 Demonstrate the ability to configure a Virtual Private Network (VPN).
	127.08 Describe the function of Network Address Translation (NAT).
128.0	Develop an awareness of cryptography and its relation to security. – The student will be able to:
	128.01 Demonstrate an understanding of security algorithms and encryption.
	128.02 Use and apply Public Key Certificates.
	128.03 Demonstrate an understanding of standards and protocols in commerce.
129.0	Incorporate organizational and operational security in an appropriate and effective manner. – The student will be able to:
	129.01 Describe how to establish a network security policy.
	129.02 Explain the importance of physical security to protect network resources.
	129.03 Identify and use disaster recovery procedures.
	129.04 Describe the importance of business continuity and its relationship to network and corporate security.
	129.05 Describe security policies and procedures that would be used in a business environment.
	129.06 Explain the importance of privilege management (access, password management, sign-on).
	129.07 Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches).
	129.08 Explain the importance of educating users and supervisors in regard to network security.
	129.09 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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 9, Language 9, and Reading 9. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 27-1014 – Multimedia Artists and Animators
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 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	SOC Code
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	15-1199
B	DIG0071	Game/Simulation Graphic Artist		150 hours	27-1014
C	DIG0072	Game/Simulation 3D Animator		150 hours	27-1014

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 & 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.

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

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 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 – SOC Code 15-1199**	
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 skill 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 – SOC Code 27-1014**	
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 – SOC Code 27-1014	
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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 10, Language 10, and Reading 10. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 27-1014 – Multimedia Artists and Animators
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 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	SOC Code
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	15-1199
B	DIG0073	Digital Media Artist		150 hours	27-1014
C	DIG0074	Digital Media Specialist		150 hours	27-1014

*Note: OTA0040 is a highly recommended core.

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

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 – SOC Code 15-1199**	
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 skill 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 – SOC Code 27-1014**	
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 – SOC Code 27-1014**	
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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 10, Language 10, and Reading 10. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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
Standard Length	600 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other 15-1131 – Computer Programmers
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 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	SOC Code
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	15-1199
B	DIG0075	Game/Simulation Programmer		150 hours	15-1131
C	DIG0076	Game/Simulation Software Developer		150 hours	15-1131

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.

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

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 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 – SOC Code 15-1199**	
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 skill 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 – SOC Code 15-1131**
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 – SOC Code 15-1131**	
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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 10, Language 10, and Reading 10. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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 Advanced Applications**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program	
Program Number	B082400
CIP Number	0550041117
Grade Level	30, 31
Standard Length	150 hours
Teacher Certification	Refer to the **Program Structure** section.
CTSO	Phi Beta Lambda BPA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other
Basic Skills Level	N/A

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.

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 with one occupational completion point. A student who completes the applicable competencies may exit as 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	SOC Code
A	DIG0077	Game, Simulation, & Animation Advanced Applications	BUS ED 1 @2 COMPU SCI 6 COMM ART @7 7G TV PRO TEC @ 7 7G	150 hours	15-1199

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:

(a) Time spent on the project (log in and log out)
(b) Description of the activity for the period(s)
(c) Materials/equipment/fixtures used
(d) Problems identified
(e) Possible solutions to problems identified

(f) Work accomplished
(g) Solutions attempted
(h) Solutions that failed
(i) Which led to a new problem statement
(j) Video or Still Images of the project as it progresses.
(k) 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) a review of the portfolio and the journal,
(b) a demonstration of the project's final product
(c) results
(d) problems identified and solutions that worked or did not work, and
(e) 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.

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

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

Program Title: Game/Simulation/Animation Advanced Applications
Career Certificate Program Number: B082400

Course Number: DIG0077 **Occupational Completion Point: A** **Game, Simulation, & Animation Advanced Applications – 150 Hours – SOC Code 15-1199**
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.
	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.
	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.
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 Edit and proof the research report. Use proper form for a bibliography, footnotes, quotations, and references.
	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.
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 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.

Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and Business Professionals of America (BPA) are the intercurricular 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.

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: Mathematics 10, Language 9, and Reading 9. 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(7), 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(3)(a), 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(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

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.