Florida Department of Education
Curriculum Framework

Program Title: **Commercial Fishing**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	8751200
CIP Number	0649030300
Grade Level	9 – 12
Standard Length	5 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	53-5021 – Captains, Mates, and Pilots of Water Vessels

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, crew duties on seagoing boats, trailers, and small ships. Included are vessel operation and maintenance, vessel navigation, vessel handling, shrimp and net fishing, pot and line fishing, and galley operation/food preparation.

The purpose of this program is to prepare students for initial employment as an officer or fishing vessel captain (SOC 53-5021).

The plan of instruction prepares individuals for crew duties on seagoing boats, barges and ships. Included are boat operation, fishing operations, cleaning and preservation, loading and unloading and emergency procedures.

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

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
	8751210	Commercial Fishing 1		1 credit		2	
A	8751220	Commercial Fishing 2		1 credit	53-5021	2	
	8751230	Commercial Fishing 3	COMM FISH 7G	1 credit		2	
	8751240	Commercial Fishing 4		1 credit		2	
B	8751250	Commercial Fishing 5		1 credit	53-5021	2	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8751210	**	**	**	**	**	**	**	**	**	**	**
8751220	**	**	**	**	**	**	**	**	**	**	**
8751230	**	**	**	**	**	**	**	**	**	**	**
8751240	**	**	**	**	**	**	**	**	**	**	**
8751250	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8751210	**	**	**	**	**	**	**
8751220	**	**	**	**	**	**	**
8751230	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8751240	**	**	**	**	**	**	**
8751250	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Unlock and get a vessel underway.
02.0 Dock a vessel.
03.0 Operate a vessel at sea.
04.0 Maneuver around offshore structures.
05.0 Anchor vessel.
06.0 Manage and perform cargo-handling duties.
07.0 Perform shrimp boat deckhand duties.
08.0 Perform net fisher duties.
09.0 Perform pot fisher duties.
10.0 Perform line fisher duties.
11.0 Bring vessel into port.
12.0 Perform crew operational and maintenance duties aboard a vessel in port.
13.0 Prepare meals aboard vessel.
14.0 Plan and perform emergency procedures.
15.0 Demonstrate appropriate communication skills.
16.0 Demonstrate appropriate math skills.
17.0 Demonstrate appropriate understanding of basic science.
18.0 Demonstrate employability skills.
19.0 Demonstrate an understanding of entrepreneurship.

Florida Department of Education
Student Performance Standards

Course Title: **Commercial Fishing 1**
Course Number: **8751210**
Course Credit: **1**

Course Description:
The Commercial Fishing 1 course prepares students for entry into the commercial fishing industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study vessel underway procedures, docking, and vessel operation.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Unlock and get vessel underway.-The student will be able to:		
01.01	Bleed air compressor of water.		
01.02	Check and maintain batteries.		
01.03	Measure fuel in day tank.		
01.04	Maintain proper level of coolant in expansion tank.		
01.05	Use proper testing procedure to determine if all navigation lights are functioning.		
01.06	Use a torque wrench to tighten engine mounts to predetermined level.		
01.07	Inspect water level indicators for cleanliness.		
01.08	Test marine radio equipment using proper technique.		
01.09	Inspect antenna for physical damage.		
01.10	Determine if hydraulic steering equipment is free of air and water.		
01.11	Inspect fire-fighting equipment for excessive wear, proper location, and prescribed type.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
01.12 Inspect buoyant apparatuses for excessive wear, proper location and prescribed type.		
01.13 Determine that rudder-stuffing box is functioning properly.		
01.14 Tighten propeller stuffing box.		
01.15 Inspect vessel for fuel leakage.		
01.16 Prepare list of equipment to be checked for oil leakage.		
01.17 Use a voltage meter to determine if proper voltage is being generated.		
01.18 Maneuver vessel from berth into navigable waterway.		
01.19 Pump out bilges.		
01.20 Secure loose deck equipment.		
01.21 Secure watertight doors, hatches, vents and skylights.		
02.0 Dock a vessel.-The student will be able to:		
02.01 Assign crewmembers positions for mooring vessel.		
02.02 Cast off vessel's mooring lines while remaining on dock.		
02.03 Cast off vessel's mooring lines while remaining aboard vessel.		
02.04 Demonstrate how to tie various knots used in maritime operations.		
02.05 Maneuver vessel to dock.		
02.06 Release towing gear aboard towing vessel and barges.		
02.07 Demonstrate how to secure mooring lines to dock.		
02.08 Demonstrate how to secure mooring lines to vessel.		
02.09 Summarize the steps for securing the engine room.		
02.10 Secure propeller shaft.		
02.11 Inspect engine room equipment for proper maintenance and safety.		
02.12 Determine the correct nautical chart prior to departure.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
02.13 Prepare vessel to take on fuel and lube oil.		
02.14 Prepare to take on water aboard vessel.		
02.15 Demonstrate how to splice an eye into line.		
03.0 Operate vessel at sea.-The student will be able to:		
03.01 Act as vessel's lookout.		
03.02 Determine if electrical connections and outlets are tight and dry.		
03.03 Use a volt meter to determine if electrical outlets have proper voltage.		
03.04 Change air filters on engines.		
03.05 Change oil and fuel filters on engines.		
03.06 Change oil in engines.		
03.07 Demonstrate knowledge of the rules of the road in operating a vessel.		
03.08 Determine time of arrival when current effect is known.		
03.09 Determine time of arrival when current effect is unknown.		
03.10 Display day or night signals for different towing situations.		
03.11 Inspect heaving lines, mooring lines, and fixed and running rigging for excessive wear.		
03.12 Clean engine room and its equipment.		
03.13 Determine position by using Omega navigation system or equipment.		
03.14 Steer a course by using the magnetic compass.		
03.15 Operate radar equipment.		
03.16 Interpret basic meteorological data from different sources.		
03.17 Determine "distance off" by using angular measurements.		
03.18 Establish a vessel's dead reckoning (DR) track.		
03.19 Plot position by using GPS and GPS overprint charts.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
03.20 Chip and paint vessel.		

Florida Department of Education
Student Performance Standards

Course Title: **Commercial Fishing 2**
Course Number: **8751220**
Course Credit: **1**

Course Description:
The Commercial Fishing 2 course is designed to build on the skills and knowledge students learned in the Commercial Fishing 1 course for entry into the commercial fishing industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study maneuvering, anchoring, cargo handling duties.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.0	Maneuver around offshore structures.-The student will be able to:		
04.01	Assist personnel in boarding personnel basket.		
04.02	Maneuver vessel to discharge passengers.		
04.03	Maneuver vessel to discharge cargo.		
04.04	Demonstrate the proper method to secure hoses on board vessel.		
04.05	Demonstrate the proper methods to secure lashings, hawsers, or mooring lines on board vessel.		
05.0	Anchor vessel.-The student will be able to:		
05.01	Anchor vessel.		
05.02	Maneuver vessel to anchorage area.		
05.03	Anchor vessel by using anchor winch.		
05.04	Anchor vessel by using anchor windlass.		
05.05	Stack (tier) anchor chain in chain locker.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.0 Manage and perform cargo handling duties.-The student will be able to:		
06.01 Adjust vessel's mooring lines to allow for variations of tides and current.		
06.02 Determine if all cargo is aboard.		
06.03 Determine if all deck cargo is secured.		
06.04 Determine if vessel is loaded in compliance with stability laws.		
06.05 Discharge cargo by using bulk cargo system.		
06.06 Load cargo by using bulk cargo system.		
06.07 Prepare list of lost or damaged cargo.		

Florida Department of Education
Student Performance Standards

Course Title: **Commercial Fishing 3**
Course Number: **8751230**
Course Credit: **1**

Course Description:
The Commercial Fishing 3 course is designed to build on the skills and knowledge students learned in the Commercial Fishing 2 course for entry into the commercial fishing industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study deckhand, net fisher, pot fisher and line duties.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Perform shrimp boat deckhand duties.-The student will be able to:		
07.01	Stand lookout, steering, and engine room watches.		
07.02	Attach nets, slings, hooks, and other lifting devices to cables, booms, and hoists.		
07.03	Load equipment and supplies aboard vessel by hand or using hoisting equipment.		
07.04	Signal other workers to move, hoist, and position loads.		
07.05	Attach accessories, such as floats, weights, and markers to nets and lines.		
07.06	Pull and guide nets and lines onto vessel.		
07.07	Remove shrimp from nets.		
07.08	Sort, clean and identify marine life and return undesirable and illegal catch to the sea.		
07.09	Operate brine tank and refrigeration equipment.		
07.10	Place catch in containers and store in hold and cover with salt and ice.		
07.11	Wash decks, conveyors, knives, and other equipment, using proper sanitary procedures.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.12	Lubricate, adjust, and make minor repairs to engines and equipment.		
08.0	Perform net fisher duties.-The student will be able to:		
08.01	Demonstrate proper procedures to catch finfish, shellfish, and other marine life alone or as crew.		
08.02	Use and operate equipment such as dip, diver, gill, hoop, lampara, pound, trap, reef, trammel, and travel nets.		
08.03	Use and operate equipment such as purse seine, haul, drag, or beach seine following legal limits.		
08.04	Insert and attach hoops, rods, poles, ropes, floats, weights, beam runners, other boards, and cables to form, reinforce, position, set tow and anchor net.		
08.05	Attach flags and lights to buoys to identify net location.		
08.06	Put net into water and anchor or tow net according to kind of net used, location of fishing area, and method of fishing.		
08.07	Haul net to boat or shore manually and using winch.		
08.08	Empty catch from net, using dip net, brail bucket, hydraulic pump, and conveyor, and by lifting net, using block and tackle, and dumping catch.		
08.09	Store catch in hold and containers, or transfer catch to base ship or bigger boat.		
08.10	Ride in skiff and hold end of net as base ship discharges net to surround school of fish or other seafood.		
08.11	Sort and clean fish.		
08.12	Repair fishing nets and gear.		
08.13	Act as lookout or observe instruments to sight schools of fish.		
09.0	Perform pot fisher duties.-The student will be able to:		
09.01	Fish for marine life, including crab, eel, or lobster, using pots (cages with funnel-shaped net openings).		
09.02	Tie marker float to line, attach line to pot, fasten bait inside pot, and lower pot into water.		
09.03	Hook marker float with pole and pull up pot.		
09.04	Reach through hinged door of pot to remove catch or dump catch on deck.		
09.05	Measure catch with fixed gauge to insure compliance with legal size.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.06	Place legal catch in container and toss illegal catch overboard.		
09.07	Rubber band claws to prevent lobsters in container from killing each other.		
09.08	Rig and lower dredge (rake scoop with bag net attached), drag dredge behind boat to gather marine life from water bottom, and hoist it to deck by hand using block and tackle.		
10.0	Perform line fisher duties.-The student will be able to:		
10.01	Catch fish and other marine life with hooks and lines, working alone or as a member of crew.		
10.02	Lay out line and attach hooks, bait, sinkers, and various anchors, floats, and swivels, depending on the targeted species sought.		
10.03	Put line into water, and hold, anchor, or troll (tow) line to catch fish.		
10.04	Haul line onto boat deck by hand, reel, or synch, and remove catch.		
10.05	Store catch in hold or boxes and pack catch in ice.		
10.06	Hit fish with club to stun it before removing it from hook.		
10.07	Use gaff to assist in lifting fish from water and placing them on the deck.		
10.08	Use proper and safe technique to slit fish, remove viscera, and wash cavity to clean fish for storage.		
10.09	Navigate vessel in fishing area safely and legally.		

Florida Department of Education
Student Performance Standards

Course Title: **Commercial Fishing 4**
Course Number: **8751240**
Course Credit: **1**

Course Description:
The Commercial Fishing 4 course is designed to build on the skills and knowledge students learned in the Commercial Fishing 3 course for entry into the commercial fishing industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study bringing vessels into port, and crew operations and maintenance.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.0	Bring vessel into port.-The student will be able to:		
17.01	Determine approximate position and hazardous conditions by using depth recorder.		
17.02	Determine position by using GPS satellite information.		
17.03	Determine vessel's course and position against dead reckoning plots.		
12.0	Perform crew operational and maintenance duties aboard vessel in port.-The student will be able to:		
12.01	Prepare and perform necessary duties for dry-docking a vessel.		
12.02	Change lube oil filters on auxiliary engines.		
12.03	Change fuel filters on auxiliary engines.		
12.04	Clean electric motor.		
12.05	Prepare a list of hoses, valves, connections, gaskets, and tanks that have been determined to need repairs.		
12.06	Determine if const-a-voltage regulator is functioning properly.		
12.07	Determine if drive bolts on air compressors are excessively loose.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.08 Tighten panel box fittings to prevent vibration.		
12.09 Clean keel cool strainers.		
12.10 Clean oil coolers.		
12.11 Clean oil strainers in marine gears.		
12.12 Drain water out of fuel traps.		
12.13 Check tightness of fuel and oil line connections on engines and tighten if necessary.		
12.14 Inspect day tanks containing fuel for leaks.		
12.15 Lubricate deck and engine room equipment on a regular schedule.		
12.16 Determine vessel's manning requirements.		
12.17 Wash down vessel's superstructure and decks.		

Florida Department of Education
Student Performance Standards

Course Title: **Commercial Fishing 5**
Course Number: **8751250**
Course Credit: **1**

Course Description:
The Commercial Fishing 5 course is designed to build on the skills and knowledge students learned in the Commercial Fishing 4 course for entry into the commercial fishing industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study preparing meals, emergency procedures, math, science, and employability skills, and entrepreneurship.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.0 Prepare meals aboard vessel.-The student will be able to:		
13.01 Make yeast breads.		
13.02 Make pie crust.		
13.03 Make cream filling in pie.		
13.04 Make pancakes.		
13.05 Make corn bread.		
13.06 Make cakes.		
13.07 Make biscuits.		
13.08 Clean galley deck, woodwork, and cabinets.		
13.09 Wash dishes, glasses, flatware, trays, pots and pans.		
13.10 Cook vegetables by boiling, simmering and steaming.		
13.11 Cook meats, seafood, and fowl by frying.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.12 Cook meats, seafood, and fowl by stewing and braising.		
13.13 Cook meats, seafood, and fowl by broiling.		
13.14 Cook meats, seafood, and fowl by roasting or baking.		
13.15 Cook meats, seafood, and fowl by braising.		
13.16 Season and bread meats, seafood, and fowl for baking, roasting, broiling and frying.		
13.17 Cook eggs by frying and scrambling.		
13.18 Make gravies.		
13.19 Make coffee.		
13.20 Make salads.		
13.21 Prepare soup stock.		
13.22 Prepare sandwiches.		
13.23 Prepare dehydrated or concentrated foods.		
13.24 Make soup with stock, meats, vegetables, and seasonings, as required by recipe.		
13.25 Carve cooled meats.		
13.26 Cut, trim, and bone beef, lamb, pork, or fish into prescribed portions for steaks, chops, and fillets.		
13.27 Clean and care for equipment using proper sanitary procedures.		
13.28 Order food.		
13.29 Plan menu.		
13.30 Keep records for purchasing foods.		
13.31 Store food.		
13.32 Keep continuous inventory of food items.		
14.0 Plan and perform emergency procedures.-The student will be able to:		
14.01 Act as lookout to keep person in sight who has been lost overboard.		
14.02 Administer first aid to prevent shock.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.03 Administer first aid to control bleeding.		
14.04 Administer CPR		
14.05 Launch lifeboat and life raft.		
14.06 Close emergency fuel shutoff valves.		
14.07 Extinguish class A, B, and C type fires.		
14.08 Maneuver life raft or lifeboat away from vessel.		
14.09 Maneuver vessel to return to area in which person was lost overboard.		
14.10 Issue life preservers for use by passengers and crew.		
14.11 Secure engine room to prevent spread of fire.		
14.12 Send out distress signals.		
14.13 Sound abandon-ship alarm.		
14.14 Train crew to perform emergency procedures.		
15.0 Demonstrate appropriate communication skills.-The student will be able to:		
15.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03 Read and follow written and oral instructions.		
15.04 Answer and ask questions coherently and concisely.		
15.05 Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06 Demonstrate appropriate telephone/communication skills.		
16.0 Demonstrate appropriate math skills.-The student will be able to:		
16.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.05	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science.-The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems that may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
17.04	Understand pressure measurement in terms of PSI, inches of mercury, and KPA.		
18.0	Demonstrate employability skills.-The student will be able to:		
18.01	Conduct a job search using periodicals and the internet.		
18.02	Secure information about a job.		
18.03	Identify documents that may be required when applying for a job interview.		
18.04	Complete a job application form correctly.		
18.05	Demonstrate competence in job interview techniques.		
18.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.		
18.07	Identify acceptable work habits.		
18.08	Demonstrate knowledge of how to make appropriate job changes.		
18.09	Demonstrate acceptable employee health habits.		
18.10	Demonstrate knowledge of the Federal Law as recorded in (29 CFR-1910.1200)		
19.0	Demonstrate an understanding of entrepreneurship.-The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.03 List the advantages and disadvantages of business ownership.		
19.04 Identify the risks involved in ownership of a business.		
19.05 Identify the necessary personal characteristics of a successful entrepreneur.		
19.06 Identify the business skills needed to operate a small business efficiently and effectively.		

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)

SkillsUSA is the intercurricular career and technical student organization 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

Accommodations

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

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

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different

competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Course Title: **Transportation, Distribution and Logistics Cooperative Education-OJT**
Course Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Cooperative Education - OJT	
Course Number	9500420
CIP Number	06499999CP
Grade Level	9 – 12
Standard Length	Multiple credits
Teacher Certification	Refer to the **Course Structure** section
CTSO	SkillsUSA

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 Transportation, Distribution and Logistics cluster(s); 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 Transportation, Distribution and Logistics cluster(s).

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

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

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

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

Course Structure

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

The following table illustrates the secondary course structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
9500420	Transportation, Distribution and Logistics Cooperative Education-OJT	Any District Certification appropriate to the students' chosen career field	Multiple Credits	2	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

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

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 Perform designated job skills.
02.0 Demonstrate work ethics.

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Florida Department of Education
Student Performance Standards

Program Title: **Transportation, Distribution and Logistics Cooperative Education OJT**
Program Number: **9500420**

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

Standards and Benchmarks
02.04 Demonstrate acceptable business ethics.

Additional Information

Special Notes

The **Cooperative Education Manual** is available on-line and has guidelines for students, teachers, employers, parents and other administrators and sample training agreements. It can be accessed on the DOE Website.

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)

SkillsUSA is the intercurricular career and technical student organization 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. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

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

Florida Department of Education
Curriculum Framework

Course Title: **Transportation, Distribution and Logistics Directed Study**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Course Number	9501000
CIP Number	0649999901
Grade Level	11 – 12
Standard Length	1 credit - Multiple credits
Teacher Certification	Refer to the **Course Structure** section
CTSO	SkillsUSA

Purpose

The purpose of this course is to provide students with learning opportunities in a prescribed program of study within the Transportation, Distribution and Logistics cluster(s) that will enhance opportunities for employment in the career field chosen by the student.

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

Course Structure

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

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

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

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

The following table illustrates the secondary course structure:

Course Number	Course Title	Teacher Certification	Length	Level	Graduation Requirement
9501000	Transportation, Distribution and Logistics Directed Study	Any District Certification appropriate to the students' chosen career field	1 credit – Multiple Credits	2	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

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

Florida Department of Education
Student Performance Standards

Course Title: **Transportation, Distribution and Logistics Directed Study**
Course Number: **9501000**
Course Credit: **1**

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

Additional Information

Laboratory Activities

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

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)

SkillsUSA is the intercurricular career and technical student organization 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. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Global Logistics and Supply Chain Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9503100
CIP Number	0652020300
Grade Level	9 - 12
Standard Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA, FL-TSA
SOC Codes (all applicable)	11-3071 – Transportation, Storage, and Distribution Managers 43-5071 – Shipping, Receiving, and Traffic Clerks 13-1081 – Logisticians 15-1151 – Computer User 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 in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to: the global supply chain, the logistics environment, safety principles, quality control principles, work communication practices, teamwork-workplace behavior- and problem solving, supply chain computer systems, supply chain life cycle, product receiving and stocking, product order processing, product shipment, safe operation and use of equipment, inventory control, safe handling of hazardous materials, customs process/free trade, modes of transportation (air, sea, truck, and rail), dispatch operations, routing and tracking operations, and customer relations.

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

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9503110	Global Logistics and Supply Chain Technology	BUS ED 1 LOG TECH 7G	1 credit	11-3071	3	
B	9503120	Introduction to Information Technology Applications		1 credit	15-1151	3	
		OR					
B	8207310	Digital Information Technology	DIT Teacher Certifications	1 credit	15-1151	2	PA
C	9503130	Global Logistics Operations	BUS ED 1 LOG TECH 7G	1 credit	43-5071	3	
D	9503140	Global Logistics Management		1 credit	13-1081	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9503110	**	**	**	**	**	**	**	**	**	**	**
9503120	**	**	**	**	**	**	**	**	**	**	**
8207310	5/87 6%	5/80 6%	24/83 29%	5/69 7%	24/67 36%	5/70 7%	5/69 7%	24/82 29%	5/66 8%	24/74 32%	5/72 7%
9503130	**	**	**	**	**	**	**	**	**	**	**
9503140	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9503110	**	**	**	**	**	**	**
9503120	**	**	**	**	**	**	**
8207310	20/67 30%	15/75 20%	18/54 33%	40/46 87%	40/45 89%	40/45 89%	40/45 89%
9503130	**	**	**	**	**	**	**
9503140	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate an understanding of global logistics and supply chain
02.0 Demonstrate an understanding of transportation systems
03.0 Demonstrate professional communication skills
04.0 Demonstrate customer service skills

Introduction to Information Technology Applications – (9503120)
05.0 Demonstrate knowledge and skill of information technology applications related to logistics and supply chain management.
06.0 Demonstrate knowledge and skill of common software applications.
07.0 Demonstrate knowledge and skill in using technology to enhance the effectiveness of communication skills utilizing word processing applications.
08.0 Demonstrate knowledge and skill in using technology to enhance communication skills utilizing presentation applications.
09.0 Demonstrate knowledge and skill in using technology to enhance the effectiveness of communication utilizing spreadsheet and database applications.
10.0 Demonstrate knowledge and skill in using technology to enhance communication skills utilizing electronic mail.
11.0 Demonstrate proficiency using computer networks, internet, and online databases to facilitate collaborative communication.
12.0 Develop an awareness of emerging technologies.
13.0 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.
14.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.

OR

Digital Information Technology – (8207310) Standards 15.0 – 28.0 are associated with this course.
15.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance.
16.0 Develop an awareness of microprocessors and digital computers.
17.0 Demonstrate an understanding of operating systems.
18.0 Use technology to enhance the effectiveness of communication skills utilizing word processing applications.
19.0 Use technology to enhance communication skills utilizing presentation applications.
20.0 Use technology to enhance the effectiveness of communication utilizing spreadsheet and database applications.
21.0 Use technology to enhance communication skills utilizing electronic mail.
22.0 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.
23.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
24.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
25.0 Demonstrate competence in page design applicable to the WWW.

26.0 Develop an awareness of emerging technologies.
27.0 Develop awareness of computer languages and software applications.
28.0 Demonstrate comprehension and communication skills.

29.0 Demonstrate an understanding of warehouse operations
30.0 Demonstrate an understanding of storage and control operations
31.0 Demonstrate an understanding of protection skills
32.0 Demonstrate an understanding of economics
33.0 Demonstrate an understanding of career readiness
34.0 Demonstrate employability skills
35.0 Demonstrate competencies in a specific career
36.0 Demonstrate career acquisition
37.0 Demonstrate career retention
38.0 Demonstrate integrated learning and life skills
39.0 Demonstrate technology and information

Florida Department of Education
Student Performance Standards

Course Title: **Global Logistics and Supply Chain Technology**
Course Number: **9503110**
Course Credit: **1**

Course Description:
The Global Logistics and Supply Chain Technology course prepares students for entry into the logistics and supply chain industry. Students explore career opportunities and requirements of a professional logistician. Content emphasizes beginning skills key to the success of working in the logistics and supply chain industry. Students study and gain a basic understanding of global logistics and supply chain technology, transportation systems, communication skills, and customer service skills.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate an understanding of global logistics and supply chain.-The student will be able to:		
01.01	Discuss the history, career fields, and benefits of the global supply chain industry.		
01.02	Describe principal elements of the logistics environment and logistics systems.		
01.03	Explore career pathways within global logistics and supply chain.		
01.04	Explain ways in which handling of product throughout supply chain logistics affects company's viability and profitability.		
01.05	Define basic principles of cost effectiveness throughout supply chain logistics.		
01.06	Define basic principles of just-in-time purchasing and inventory control.		
01.07	Identify major security requirements applicable to the logistics environment.		
01.08	Cite examples of environmental and financial impacts of logistics activities.		
01.09	Describe the alignment between the supply chain strategy and business strategy.		
01.10	Define basic principles of customs, free trade and international issues in Supply Chain Management, including foreign trade zones and why they exist.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.11	Describe factors in the marketplace that can impact decision making.		
01.12	Identify local chambers of commerce as well as industry professional associations.		
02.0	Demonstrate an understanding of transportation systems.-The student will be able to:		
02.01	Identify various transportation modes, and what authority (local or national) regulates each one.		
02.02	Describe and contrast the different modes of transportation and their advantages/disadvantages.		
02.03	List the main considerations in determining the best mode.		
02.04	Explain how to use the information on performance and costs for mode selection to enhance rapid decision making.		
02.05	Give examples of transportation documentation, dispatch, routing and tracking.		
02.06	Describe and assess global freight transportation systems.		
02.07	Describe the government's involvement in transportation and explain freight transportation laws, regulations, and policies.		
02.08	Determine which transportation method is most appropriate for various situations.		
03.0	Demonstrate professional communication skills.-The student will be able to:		
03.01	Show effective methods for communications between shifts.		
03.02	Identify effective communications to both internal and external customers.		
03.03	Identify ways to elicit clear statements of customer requirements and specifications.		
03.04	Provide examples of effective written communications in logistics/supply chain workplace.		
03.05	Provide examples of effective oral communications in logistics/supply chain workplace.		
03.06	Demonstrate an understanding of teamwork and good professional workplace behavior to solve problems.		
03.07	Describe a high-performance team.		
03.08	List characteristics of an effective team member.		
03.09	Explain ways to set team goals.		
03.10	Identify use of team environment to solve problems and resolve conflicts.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
03.11	Describe typical requirements for good workplace conduct.		
03.12	Demonstrate understanding of social media platforms.		
03.13	Read and comprehend technical and non-technical reading assignments related to course content, including, books, magazines and electronic sources.		
03.14	Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.		
03.15	Apply the writing process to the creation of appropriate documents following designated business formats. (e.g., note taking, research, MLA/APA)		
03.16	Demonstrate an awareness of project management concepts and tools. (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration)		
04.0	Demonstrate customer service skills.-The student will be able to:		
04.01	Exhibit acceptable workplace dress or attire, including safety clothing requirements where applicable.		
04.02	Exhibit punctuality, initiative, courtesy, loyalty, and honesty.		
04.03	Use a personality inventory for personal improvement.		
04.04	Exhibit the ability to get along with others.		
04.05	Discuss the importance of human relations.		
04.06	Develop and demonstrate the unique human relations skills needed for successful entry and progress in the customer service occupations or marketing occupations selected as a career objective.		
04.07	Differentiate between an acceptable and an unacceptable code of business ethical conduct.		
04.08	Compare and contrast various international business customs.		

Florida Department of Education
Student Performance Standards

Course Title: **Introduction to Information Technology Applications**
Course Number: **9503120**
Course Credit: **1**

Course Description:
The Introduction to Information Technology Applications course is designed to build on the skills and knowledge students learned in Global Logistics and Supply Chain Technology for entry into the logistics and supply chain industry. Students explore career opportunities and requirements of a professional logistician. Content emphasizes knowledge and skills of information technology applications, common software applications, word processing, presentation, spreadsheet, and database applications. Additionally, content knowledge and skills related to electronic communication methods, understanding computer networking, awareness of emerging technologies, college and career readiness, and appropriate leadership techniques.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.0	Demonstrate knowledge and skill of information technology applications related to logistics and supply chain management.-The student will be able to:		
05.01	Describe the impact of technology on society.		
05.02	Develop keyboarding skills to enter and manipulate text and data.		
05.03	Explain main uses of computer systems by front-line workers.		
05.04	Identify technologies used to capture and store logistics information.		
05.05	Explain the concepts and use of various information technologies in logistics.		
05.06	Research, describe, access, and evaluate Internet-based business models.		
05.07	Describe and use current and emerging computer technologies and software to perform business tasks.		
05.08	Identify and describe types of file systems and classify common file extensions based on software application programs.		
05.09	Use reference materials. (e.g. on-line help, tutorials, manuals, vendor bulletin boards)		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.10	Demonstrate basic computer file management skills and file naming conventions to accurately organize files into hierarchies by labeling file folders for easy accessibility.		
05.11	Describe and understand the general architecture of a microcomputer system.		
05.12	Discuss the process of troubleshooting problems with computer hardware, input and output devices.		
05.13	Differentiate between diagnosing and troubleshooting.		
05.14	Explain the need for and use of peripherals.		
05.15	Describe ethical issues and problems associated with computers and information systems, including federal laws against anti-piracy with computers and PC software security protection.		
05.16	Demonstrate proficiency with file management and structure. (e.g., folder creation file creation, backup copy, delete, open, save)		
05.17	Compare and contrast various computer operating systems.		
05.18	Select and apply an information technology application for procurement, acquisition, logistics, and supply chain management.		
06.0	Demonstrate knowledge and skill of common software applications.-The student will be able to:		
06.01	Compare and contrast the appropriate use of various software applications. (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music)		
06.02	Demonstrate the use of various software applications. (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music).		
07.0	Demonstrate knowledge and skill in using technology to enhance the effectiveness of communication skills utilizing word processing applications.-The student will be able to:		
07.01	Select and use word processing software and accompanying features to enhance written business communications.		
07.02	Share and maintain documents by applying different views and protection to a document and manage document versions.		
07.03	Share and save a document and apply a template. (e.g., pdf, html, blog, hyperlinks)		
07.04	Format content to a document by applying font, paragraph attributes, indent and tab settings to text and paragraphs.		
07.05	Apply spacing settings to text and paragraphs.		
07.06	Navigate and search through a document, create and manipulate tables.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.07	Apply page layout and reusable content by editing and manipulating page setup settings and applying themes.		
07.08	Create and manipulate page backgrounds, headers and footers.		
07.09	Use image design theory and software to create illustrations, shapes, and graphics and include a selection in a document.		
07.10	Insert and format graphic images.		
07.11	Apply and manipulate text boxes.		
07.12	Proofread documents by validating content through the use of spell and grammar check.		
07.13	Configure autocorrect settings, insert and modify comments in a document.		
07.14	Apply references and hyperlinks, create end and footnotes, and create a table of contents in a document.		
07.15	Perform various mail merge options, macros and tracking revisions		
08.0	Demonstrate knowledge and skill in using technology to enhance communication skills utilizing presentation applications.-The student will be able to:		
08.01	Manage and configure the presentation software environment, including: adjusting views, manipulating window, configuring toolbar and file options.		
08.02	Create slide presentations utilizing various project development elements, including: adding and removing slides, slide layouts, format slide design, insert or format placeholders.		
08.03	Locate, create and incorporate graphical and multimedia elements, including: shapes, graphics, images, bullets, hyperlinks, video, and audio into a slide presentation appropriate for the project.		
08.04	Explore and apply design and color theory to create dynamic and appealing visuals.		
08.05	Create and manipulate graphical and multimedia elements to improve or develop new contacts appropriate for the project, including: creation of images, color selections, tone, hue and contrast.		
08.06	Demonstrate various business-related elements that can be created, embedded and manipulated in a slide presentation, including: charts, graphs, tables, spreadsheets, flowcharts, and organizational charts.		
08.07	Apply slide transitions and create custom animations to slide presentations appropriate for the target audience.		
08.08	Demonstrate different delivery methods for slide presentations, including: packaging for CD delivery, video projection – on mouse click, rehearsed timings, printing options - outlines, handouts, slides and notes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.0	Demonstrate knowledge and skill in using technology to enhance the effectiveness of communication utilizing spreadsheet and database applications.-The student will be able to:		
09.01	Manage the worksheet environment by navigating through and printing a worksheet.		
09.02	Personalize the environment by manipulating the ribbon tabs, group settings, importing data/database, manipulating properties, files and folders.		
09.03	Create cell data, apply auto fill and hyperlinks.		
09.04	Format cells and worksheets by applying cell formats, merging and splitting cells, create row and column titles, hide and unhide column titles, rows and columns.		
09.05	Manipulate page set up options.		
09.06	Create and apply cell styles.		
09.07	Manage worksheets and workbooks by creating and formatting worksheets and manipulating views/themes.		
09.08	Apply formulas and functions by creating formulas, enforcing precedence and cell formula references.		
09.09	Apply conditional formula logic, name and cell ranges.		
09.10	Demonstrate data visually by creating and modifying charts and images. (e.g., pivot tables)		
09.11	Share worksheet data through email, changing file type and different versions. (e.g., mail merge)		
09.12	Analyze and organize data through filters, sorting and applying conditional formatting. (e.g., macros)		
09.13	Create different forms for inputting data into a database application.		
09.14	Interpret queries for specialized reports using a database application.		
09.15	Interpret data on line graphs, pie charts, diagrams, and tables commonly used in spreadsheet software applications that incorporate industry data.		
10.0	Demonstrate knowledge and skill in using technology to enhance communication skills utilizing electronic mail.-The student will be able to:		
10.01	Describe and perform e-mail capabilities and functions.		
10.02	Create and send messages, manage signature and automated messages.		
10.03	Save, send, schedule, and manage junk mail, e-mail and spam.		
10.04	Configure message sensitivity, security and delivery options.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.05	Use the Internet to perform e-mail activities, including: attaching external files, saving e-mail attachments, viewing mailbox details, establishing appointments, creating contact groups, and sending a meeting to a contact group to communicate in the workplace.		
10.06	Manage tasks and organize information. (e.g., forward e-mail)		
11.0	Demonstrate proficiency using computer networks, internet, and online databases to facilitate collaborative communication.-The student will be able to:		
11.01	Demonstrate how to connect to the Internet and use appropriate Internet protocol.		
11.02	Identify and describe web terminology, addresses and how browsers work.		
11.03	Demonstrate proficiency using basic features of GUI browsers, including: bookmarks, basic configurations, e-mail configurations, and address books.		
11.04	Describe appropriate browser security configurations.		
11.05	Describe information technology terminology, including Internet, intranet, ethics, copyright laws, and regulatory control.		
11.06	Demonstrate proficiency using search engines and search tools.		
11.07	Use various web tools, including: downloading files, transfer of files, telnet, PDF, plug-ins, cloud-based storage, and data compression.		
11.08	Identify and use Boolean search strategies.		
11.09	Understand and apply level one Universal Resource Locator (URL) and associated protocols (e.g., .com, .org, .edu, .gov, .net, etc.)		
11.10	Explain the need for web-based applications. (dangers of piracy, copyright, plagiarism)		
11.11	Describe appropriate use of social networking sites and applications, blogs and collaborative tools for file sharing.		
11.12	Describe web applications, including sharing photos and video clips, messaging, chatting and collaborating.		
12.0	Develop an awareness of emerging technologies.-The student will be able to:		
12.01	Compare and contrast emerging technologies and describe how they impact business in the global marketplace. (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, robotics, unmanned aerial systems, etc.)		
13.0	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.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.01	Analyze personal skills and aptitudes in comparison with various business related job and career options.		
13.02	Use career resources to develop an information base that reflects local and global business related occupations and opportunities for continuing education and workplace experience.		
13.03	Demonstrate job-seeking skills required for entry-level employment. (e.g., resume, cover letter, thank you letter, online/hard copy application, company research, mock interview, and follow-up call)		
13.04	Design, initiate, refine and implement a plan to facilitate growth and skill development related to anticipated job requirements and career expectations.		
13.05	Demonstrate an awareness of specific job requirements and career paths (e.g., requirements, characteristics needed) in business environments.		
13.06	Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals.		
13.07	Describe the importance of building community and mentor relationships in a variety of professional and workplace situations.		
13.08	Simulate work-based projects in an information technology environment.		
14.0	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:		
14.01	Demonstrate awareness of the following workplace essentials: Quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming.		
14.02	Demonstrate ways of accepting constructive criticism on team projects within the workplace.		
14.03	Apply appropriate strategies to manage and resolve conflicts in work situations.		
14.04	Demonstrate human relations, personal and interpersonal skills appropriate for the workplace, including: responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, and professional dress.		
14.05	Demonstrate awareness of international business culture.		

Florida Department of Education
Student Performance Standards

Course Title: **Digital Information Technology**
Course Number: **8207310**
Course Credit: **1**

Course Description:
This course is designed to provide a basic overview of current business and information systems and trends, and to introduce students to fundamental skills required for today's business and academic environments. Emphasis is placed on developing fundamental computer skills. The intention of this course is to prepare students to be successful both personally and professionally in an information based society. Digital Information Technology includes the exploration and use of: databases, the internet, spreadsheets, presentation applications, management of personal information and email, word processing and document manipulation, HTML, web page design, and the integration of these programs using software that meets industry standards. After successful completion of this course, students will have met Occupational Completion Point A, Information Technology Assistant - SOC Code 15-1151.

Digital Information Technology (8207310) is part of several programs across various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (15.0 – 28.0) have been placed in a separate document.

Florida Department of Education
Student Performance Standards

Course Title: **Global Logistics Operations**
Course Number: **9503130**
Course Credit: **1**

Course Description:
The Global Logistics Operations course is designed to build on the skills and knowledge students learned in Global Logistics and Supply Chain Technology and the Introduction to Information Technology Applications courses for entry into the logistics and supply chain industry. Students explore career opportunities and requirements of a professional logistician. Content emphasizes an understanding of warehouse operations, storage and control operations, protection, and economics.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
29.0	Demonstrate an understanding of warehouse operations.-The student will be able to:		
29.01	Identify and discuss the characteristics, purpose and importance of warehouse operations and supply chain management.		
29.02	Define material handling logistics as it applies to the warehousing function.		
29.03	Describe procedures for using computerized warehouse data.		
29.04	Define movement in a warehouse and explain the concept of movement and the vital role that efficient movement of materials plays in the total functionality of the warehouse.		
29.05	Define movement in a warehouse and identify the various locations within the warehouse where planned efficient movement of materials takes place.		
29.06	Explain channels of distribution.		
29.07	Discuss safety regulatory requirements and procedures.		
29.08	Explain the importance of storage in a warehouse.		
29.09	Define control as it applies to warehousing.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
29.10 Explain the relationship between physical structure and protection.		
29.11 Identify various types of equipment available to enhance the efficient movement of materials within a warehouse.		
29.12 Identify the various types of loading docks and cross docking.		
29.13 Define the term "peaks and valleys" as it applies to warehouse activity.		
29.14 Explain the importance of staging and JIT.		
29.15 Identify the primary types of hand-operated pieces of warehouse equipment.		
29.16 Identify the important characteristics of industrial trucks.		
29.17 Explain the concept of "balancing" as it applies to counterbalanced lift trucks.		
29.18 Define the term *narrow aisle* as it applies to fork trucks.		
29.19 Identify warehouse documents (e.g., pick tickets, special orders, inventory forms).		
29.20 Display and interpret inventory screens, receive, inspect, and stock inventory.		
30.0 Demonstrate an understanding of storage and control operations.-The student will be able to:		
30.01 Explain the concepts involved in determining the best method for storage and the equipment needed to facilitate a cost effective and efficient warehouse.		
30.02 Identify the factors that are involved with the calculating and estimating of the storage area needed for retention of materials in a warehouse.		
30.03 Identify the possibilities and combinations of systems and equipment that can be used for storage areas in a warehouse.		
30.04 Define the following storage related terms: Size, Volume, Density, Pallet, and Case.		
30.05 Define the terms packaging, SKU, stacking frame, term "Logistics Execution Systems" (LES), signage and signposting, "real time" and barcoding.		
30.06 Explain how the volume of materials, space usage, and control affect the design of storage space in a warehouse design.		
30.07 Explain various inventory control methods and their importance.		
30.08 Identify and analyze various warehouse storage systems.		
30.09 Identify the two key issues in planning block stacking.		
30.10 Identify the basic configuration for pallet rack.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
30.11	Explain the concept of control in the broadest possible context and the importance of keeping track of materials and goods.		
30.12	Identify the various types of technologies developed over the years to keep track of goods within the warehouse.		
30.13	Identify various labeling and packaging schemes available for securing and tracking the movement of items through a warehouse.		
30.14	Define the components of an LES.		
30.15	Explain the importance of addresses in signage.		
30.16	Define information-filled labeling.		
30.17	Identify key magnetic devices used in automatic data capture.		
30.18	Define radio frequency identification (RFID).		
30.19	Explain the importance of automation in warehousing.		
30.20	Identify the value of emerging technologies related to warehouse operations.		
31.0	Demonstrate an understanding of protection skills.-The student will be able to:		
31.01	Identify the role that protection plays in the total concept of "warehousing".		
31.02	Identify the various forms of unit load formation equipment that is used for protecting materials.		
31.03	Identify the types of load containment materials which include the machinery that dispenses them.		
31.04	Situations where they are most advantageously used.		
31.05	Explain the following: the need and means for protecting warehouse personnel and materials as they go about their duties.		
31.06	Identify the advantages and disadvantages of open-air or soft-wall warehousing for protection of warehoused items.		
31.07	Compliance issues.		
32.0	Demonstrate economics.-The student will be able to:		
32.01	Demonstrate understanding of goals, resources and structure of an organization.		
32.02	Understand the concepts and contributions of entrepreneurship.		
32.03	Compare and contrast the advantages and disadvantages of the various forms of business ownership.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
32.04 Understand economic principles affecting business cycles and the workforce.		
32.05 Analyze possible solutions to specific business problems.		
32.06 Apply economic decisions related to personal financial affairs, the successful operation of organizations and within a global economy.		
32.07 Understand the role of a consumer, producer, saver and investor in the market system.		
32.08 Understand the concepts and laws pertaining to customs and free trade.		

Florida Department of Education
Student Performance Standards

Course Title: **Global Logistics Management**
Course Number: **9503140**
Course Credit: **1**

Course Description:
The Global Logistics Management course is designed to build on the skills and knowledge students learned in Global Logistics and Supply Chain Technology, Introduction to Information Technology Applications, and Global Logistics Operations courses for entry into the logistics and supply chain industry. Students explore career opportunities and requirements of a professional logistician. Content emphasizes knowledge, skills, and understanding of college and career readiness, employability skills, career acquisition and retention, life skills, and technological literacy.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
33.0	Demonstrate an understanding of career readiness.-The student will be able to:		
33.01	Explain the importance of life-long learning.		
33.02	Evaluate/research occupational interests.		
33.03	Demonstrate attitudes/ethics needed for career success.		
33.04	Assess personal strengths, talents, values and interests to appropriate jobs and careers to maximize career potential.		
33.05	Use a variety of research tools (e.g., computer-assisted programs, newspapers, books, industry tours, job shadows, career fairs and the Internet) in the career exploration process.		
33.06	Evaluate postsecondary training opportunities related to career interests, including certification, licensing, apprenticeships, college and military options.		
33.07	Relate and identify career interests and transferable skills necessary for opportunities in the global workforce.		
33.08	Develop an individual career plan and portfolio.		
33.09	Analyze needs of business and industry on labor and economic trends.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
33.10	Describe the changing roles including non-traditional occupations in the workplace.		
34.0	Demonstrate employability skills.-The student will be able to:		
34.01	Identify and utilize resources used in a job search (e.g., newspaper, Internet, networking).		
34.02	Discuss importance of drug tests and criminal background checks in identifying possible employment options.		
34.03	Identify steps in the job application process including arranging for references and proper documentation.		
34.04	Identify procedures and complete documents required when applying for a job (e.g., application, W-4, I-9).		
34.05	Prepare a resume (electronic and traditional), cover letter, letter of application, follow-up letter, acceptance/rejection letter, and letter of resignation.		
34.06	Demonstrate appropriate dress and grooming for employment.		
34.07	Demonstrate effective interviewing skills (e.g., behavioral).		
34.08	Describe methods for handling illegal interview and application questions.		
34.09	Discuss state and federal labor laws regulating the workplace (e.g., Child Labor Law, sexual harassment, EEOC, ADA, and FMLA).		
34.10	Identify positive work attitudes and behaviors such as honesty, compassion, respect, responsibility, fairness, trustworthiness, and caring.		
34.11	Describe importance of producing quality work and meeting performance standards.		
34.12	Identify personal and business ethics (e.g., preventing theft, pilfering, and unauthorized discounting).		
34.13	Demonstrate orderly and systematic behavior by creating and maintaining a personal planner.		
34.14	Identify qualities typically required for promotion (e.g., productivity, dependability, responsibility).		
34.15	Identify how to prepare for job separation and re-employment.		
34.16	Create and maintain a career portfolio (e.g., resume, letters of recommendation, awards, evidence of participation in school/community/volunteer activities, employer evaluations).		
35.0	Demonstrate competencies in a specific career.-The student will able to:		
35.01	Demonstrate job performance skills as outlined in the training plan		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
35.02	Exhibit effective workplace safety practices including use of protective devices		
35.03	Display an acceptable level of productivity and quality control		
35.04	Demonstrate effective written and oral communication and listening skills when interacting with customers, co-workers, and managers		
35.05	Demonstrate decision making and problem solving processes and techniques used in the workplace.		
35.06	Demonstrate acceptable work habits and conduct in the workplace as defined by company policy		
35.07	Demonstrate an understanding of the company's vision and mission statements.		
35.08	Demonstrate an understanding of the company's goals and objectives		
35.09	Demonstrate familiarity with the company's products and services		
35.10	Demonstrate the ability to identify authority, rights, and responsibilities of both employers and employees		
36.0	Demonstrate career acquisition.-The student will be able to:		
36.01	Participate in work-based learning opportunities such as: mentoring, cooperative work, job shadows, apprenticeships and internships.		
36.02	Demonstrate effective oral and written communication skills necessary for employment.		
36.03	Demonstrate job search skills using a variety of resources.		
36.04	Apply the decision-making process to the various stages of the work life cycle.		
36.05	Identify and demonstrate employability skills including job search, selection, the interviewing process, proper dress and presentation.		
36.06	Compare and contrast compensation packages that include varying levels of wages and benefits.		
37.0	Demonstrate career retention.-The student will be able to:		
37.01	Demonstrate positive personal qualities and self-management skills (i.e. time management, organization, punctuality and attendance).		
37.02	Describe how productivity, work ethic and quality affect job stability.		
37.03	Demonstrate communication team-building and leadership skills.		
37.04	Demonstrate personal health and workplace safety procedures.		
37.05	Identify biases, harassment and discriminatory behaviors impacting job success and advancement.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
37.06	Acknowledge and respond to constructive criticism and employment evaluation.		
37.07	Understand the importance of following company policy and procedures and the legal ramifications of labor laws impacting employment.		
37.08	Understand the role of compromise in conflict resolution.		
38.0	Demonstrate integrated learning and life skills.-The student will be able to:		
38.01	Demonstrate the integration and application of academic and occupational skills in school, work and personal lives.		
38.02	Use communication, mathematical and technical skills to compare compute, and analyze complex information.		
38.03	Discuss how personal choices, experiences, technology, education/training and other factors correlate with earning a living.		
38.04	Discuss how income from employment is affected by factors such as supply and demand, geographic location, level of education, type of industry, union membership, productivity skill level and work ethic.		
38.05	Compare and contract strategies for personal finance and risk management.		
38.06	Demonstrate the ability to set, monitor and achieve clearly defined goals.		
39.0	Demonstrate technology and information.-The students will be able to:		
39.01	Apply knowledge of technology to identify and solve problems.		
39.02	Identify and evaluate how information technology developments have changed the way people work.		
39.03	Select, apply and troubleshoot software and hardware as they apply to a variety of work applications.		
39.04	Describe how new developments in varied fields or technology affect the job market and the level of worker‘s responsibilities.		
39.05	Analyze the ethical issues surrounding access, privacy and confidentiality of information in emerging technologies.		
39.06	Explore current and future positions and career paths in field of technology.		
39.07	Identify job tasks that presently are and will be in the future performed in the specified occupation (training plan).		
39.08	Create a training plan indicating competencies mastered.		
39.09	Maintain a record of employment hours and wages for auditing and budgetary purposes (e.g., time cards, budget sheets).		
39.10	Maintain an up-to-date, signed training agreement.		

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

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

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)

SkillsUSA and Florida Technology Student Association (FL-TSA) are the intercurricular 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.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Maintenance and Light Repair**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9504100
CIP Number	0647060417
Grade Level	9 – 12
Standard Length	6 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points. It is **strongly recommended** that the scope, sequence, and course recommendations be followed.

NOTE: For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends, at a minimum, the Maintenance and Light Repair (MLR) for program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

Benchmarks identified with a designation of P-1, P-2, or P-3 are ASE tasks.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
	9504110	Automotive Maintenance and Light Repair 1		1 credit		3	
	9504120	Automotive Maintenance and Light Repair 2		1 credit		3	
	9504130	Automotive Maintenance and Light Repair 3	AUTO IND @7 %7 %G	1 credit		3	
A	9504140	Automotive Maintenance and Light Repair 4	AUTO MECH @7 7G	1 credit	49-3023	3	
	9504150	Automotive Maintenance and Light Repair 5		1 credit		3	
B	9504160	Automotive Maintenance and Light Repair 6		1 credit	49-3023	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9504110	2/87 2%	4/80 5%	4/83 5%	7/69 10%	4/67 6%	1/70 1%	3/69 4%	7/82 9%	2/66 3%	11/74 15%	6/72 8%
9504120	#	#	#	#	1/67 1%	#	#	#	#	1/74 1%	1/72 1%

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9504130	2/87 2%	2/80 3%	1/83 1%	4/69 6%	1/67 1%	2/70 3%	2/69 3%	3/82 4%	2/66 3%	4/74 5%	4/72 6%
9504140	#	#	#	2/69 3%	#	#	#	1/82 1%	#	2/74 2%	#
9504150	1/87 1%	2/80 3%	1/83 1%	2/69 3%	2/67 3%	1/70 1%	2/69 3%	3/82 4%	1/66 2%	5/74 7%	6/72 8%
9504160	1/87 1%	2/80 3%	1/83 1%	4/69 6%	1/67 1%	#	1/69 1%	3/82 4%	1/66 2%	6/74 8%	5/72 7%

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504110	4/67 6%	#	2/54 4%	17/46 37%	17/45 38%	#	#
9504120	3/67 4%	3/75 4%	#	6/46 13%	6/45 13%	#	#
9504130	1/67 1%	1/75 1%	1/54 2%	#	#	11/45 24%	11/45 24%
9504140	#	#	#	#	#	8/45 18%	8/45 18%
9504150	2/67 3%	1/75 1%	1/54 2%	#	#	10/45 22%	10/45 22%
9504160	2/67 3%	1/75 1%	#	#	#	10/45 22%	10/45 22%

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry.
02.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry.
03.0 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
04.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, lubrication and cooling systems.
05.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, instrument cluster, driver information, and body electrical systems.
06.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspension systems, wheel alignment, and wheels and tires.
07.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, and related (wheel bearings, parking brake, electrical, etc.) systems.
08.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, heating, ventilation, and engine cooling, operating and related control systems.
09.0 Explain and apply proficiently the diagnosis, service and repair of engine computerized controls, fuel, air induction, exhaust, and emission control systems.
10.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of in-vehicle and off-vehicle automatic transmissions/transaxles.
11.0 Explain and apply proficiently the diagnosis, service and repair of manual drivetrain, clutches, transmissions/transaxles, drive and half-shafts, universal and constant velocity joints, differential case assemblies, drive axles, four-wheel and all-wheel drive systems.
12.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.
13.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.
14.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspension and steering systems, wheel alignment diagnosis and adjustment, and wheels and tires.
15.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.
16.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, heating, ventilation, engine cooling, operating and related control systems, refrigerant recovery, and recycling and handling.
17.0 Explain and apply proficiently the diagnosis, service and repair of engines, computerized controls, ignition, fuel, air induction, exhaust, and emission control systems.
18.0 Explain and apply proficiently the diagnosis, service, maintenance, repair and overhaul of in-vehicle and off-vehicle automatic transmissions/transaxles.
19.0 Explain and apply proficiently the diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, ring and pinion gears, differential case assembly, and drive axles.

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Maintenance and Light Repair 1**
Course Number: **9504110**
Course Credit: **1**

It is <u>strongly recommended</u> that the following scope, sequence, and course recommendations be followed.

Recommended Prerequisite: **None**
Recommended Grade Level: **9th/10th**
Recommended Credits: **1**

Course Description:
The Automotive Maintenance and Light Repair 1 course prepare students for entry into Automotive Maintenance and Light Repair 2. Students explore career opportunities and requirements of a professional service technician. Content emphasizes beginning transportation service skills and workplace success skills. Students study safety, tools, equipment, shop operations, basic engine fundamentals, and basic technician skills.

For every task in Automotive Maintenance and Light Repair 1, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
ER = Engine Repair
ASE = Required Supplemental Tasks

ER Task List:	
P-1 =	**12**
P-2 =	**2**
P-3 =	**1**
Total	**15**

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
01.0	Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry.-The student will be able to:			
01.01	Identify and apply general shop safety rules and procedures, EPA and OSHA standards.	ASE	LAFS.910.RI.1.1, 2; 3.8	
01.02	Demonstrate knowledge of appropriate automotive industry certifications.		LAFS.910.W.2.6; 3.7, 8 LAFS.910.L.1.2C	
01.03	Identify and define career opportunities in the automotive service industry.			

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
01.04 Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).		LAFS.910.W.2.6 LAFS.910.L.1.2C	
01.05 Identify appropriate emergency first aid procedures.		LAFS.910.RI.1.1, 2; 3.8	
01.06 Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE	LAFS.910.W.3.9 LAFS.910.L.1.2C	
01.07 Identify and use proper placement of floor jacks and jack stands.	ASE	LAFS.910.RI.1.1	SC.912.P.12.3
01.08 Identify and use proper procedures for safe lift operation.	ASE	LAFS.910.RI.1.1	SC.912.P.12.3
01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE	LAFS.910.RI.1.1	SC.912.E.6.6
01.10 Identify proper procedures for safe pit usage.		LAFS.910.RI.1.1	
01.11 Identify marked safety areas.	ASE	LAFS.910.RI.1.1	
01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE	LAFS.910.RI.1.1	SC.912.P.8.1
01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE	LAFS.910.RI.1.1	
01.14 Identify the location and use of eye wash stations.	ASE		
01.15 Identify the location of the posted evacuation routes.	ASE		
01.16 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.	ASE		
01.17 Identify and wear appropriate clothing for lab/shop activities.	ASE		
01.18 Secure hair and jewelry for lab/shop activities.	ASE		
01.19 Use proper handling procedures for automotive fluids.		LAFS.910.RI.1.1, 2; 3.8	SC.912.P.8.1, 2; 12.12
01.20 Identify and describe typical automotive lubricants and lubricant properties.		LAFS.910.RI.1.1, LAFS.910.W.1.2A, B, C, D, E, F; 2.4, 6 LAFS.910.L.1.2C LAFS.910.SL.1.2; 2.4	SC.912.P.8.1, 2; 12.12
01.21 Identify and describe typical automotive seals and gaskets.		LAFS.910.RI.1.1	
01.22 Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE	LAFS.910.RI.1.1	

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
01.23	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.		LAFS.910.RI.1.1	
01.24	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE	LAFS.910.RI.1.1	
01.25	Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE	LAFS.910.RI.2.4	
02.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry.-The student will be able to:			
02.01	Identify tools and equipment and their appropriate usage in automotive applications.	ASE		
02.02	Identify and use standard and metric measurement skills and designation.	ASE	MAFS.912.N-Q.1.1, 1.3	
02.03	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE		
02.04	Demonstrate proper use of precision-measuring tools (i.e. micrometer, digital/dial-indicator, digital/dial caliper) and torque methods.	ASE	MAFS.912.N-Q.1.1, 3	
03.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.-The student will be able to:			
03.01	Identify information needed and the service requested on a repair order.	ASE	LAFS.910.W.1.2A, B, C, D, E, F; 2.4 LAFS.910.L.1.2C	
03.02	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.		LAFS.910.RI.1.1	
03.03	Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.	ASE	LAFS.910.RI.1.1	
03.04	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE	LAFS.910.W.1.2A, B, C, D, E, F; 2.4 LAFS.910.L.1.2C	
03.05	Review vehicle service history.	ASE	LAFS.910.RI.1.2, .3	
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE	LAFS.910.W.1.2A, B, C, D, E, F; 2.4 LAFS.910.L.1.2C	
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.		LAFS.910.W.1.2A, B, C, D, E, F; 2.4 LAFS.910.L.1.2C	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).			

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
03.09 Determine the presence of wheel locks.			
03.10 Determine the presence of an air suspension system.			
03.11 Check operation and status of instrument panel warning lights and gauges.			
03.12 Locate and use Vehicle identification Number (VIN) vehicle information placards, decals, tags, as required.		LAFS.910.RI.1.1	
03.13 Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.		LAFS.910.RI.1.1; 2.4	
03.14 Use proper chemicals for cleaning and lubrication.			SC.912.P.8.1, 2, 8
03.15 Reset maintenance indicators as applicable.			
03.16 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	ASE		
03.17 Inspect under-hood area for leaks, damage, and unusual conditions.			
03.18 Determine fluid type requirements and identify fluid.		LAFS.910.RI.1.1; 2.4	SC.912.P.8.1, 2
03.19 Check engine oil level and condition; service as required.			
03.20 Check engine coolant level and condition; service as required.			
03.21 Check power steering fluid level and condition; service as required.			
03.22 Check brake fluid level and condition; service as required.			
03.23 Check hydraulic clutch fluid and condition; service as required.			
03.24 Check windshield washer fluid level and condition; service as required.			
03.25 Check automatic transmission fluid level and condition; service as required.			
03.26 Inspect undercar area for leaks, damage, and unusual conditions.			
03.27 Check differential/transfer case fluid level; note unusual conditions; service as required.		LAFS.910.W.1.2D, E LAFS.910.L.1.2C	
03.28 Check manual transmission fluid level; note unusual conditions; service as required.		LAFS.910.W.1.2D, E LAFS.910.L.1.2C	
03.29 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.			

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
03.30 Lubricate driveline, suspension and steering systems as applicable.			
03.31 Inspect cooling system pipes and hoses for wear, damage, and proper routing.			
03.32 Inspect and replace inline fuel filters as applicable.			
03.33 Inspect and replace air filter.			
03.34 Inspect and replace cabin air filter.			
03.35 Inspect, replace and adjust drive belts; inspect tensioners and pulleys.			
03.36 Document observed damage, unusual conditions, and concerns.		LAFS.910.W.2.4 LAFS.910.L.1.2C; 3.6	
03.37 Inspect struts, springs, and related components; service as required.			
03.38 Inspect stabilizer bar, bushings, brackets, and links; service as required.			
03.39 Inspect springs, torsion bars, and related components; service as required.			
03.40 Inspect shock absorbers and related components.			
03.41 Inspect constant velocity (CV) axle shaft boots; service as required.			
03.42 Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).			
03.43 Identify nitrogen-filled tires.		LAFS.910.RI.1.1	
03.44 Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.			
03.45 Rotate tires according to manufacturer’s recommendations.			
03.46 Balance wheel and tire assembly (static, dynamic and road force balance); where applicable.			
03.47 Dismount, inspect, and remount tire on wheel.			
03.48 Repair tire according to industry standards.			
03.49 Reinstall wheel; torque wheel fasteners to specification.		LAFS.910.RI.1.1 MAFS.912.N-Q.1.1, 3	
03.50 Check wheel bearings for play and other signs of wear.			
03.51 Perform a visual inspection of a brake drum system.			

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
03.52 Perform a visual inspection of a disc brake system.			
03.53 Check parking brake operation; check parking brake components for unusual conditions.			
03.54 Check wiper blades, inserts, and arms; replace wiper blades or inserts.			
03.55 Lubricate door latches and hinges.			
03.56 Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.			SC.912.E.6.6
03.57 Perform slow/fast battery charge.			SC.912.P.12.12
03.58 Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.			
03.59 Perform battery, starting, and charging system tests using appropriate tester.			
03.60 Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).			
03.61 Maintain or restore electronic memory functions if required.			
03.62 Inspect and replace exterior and courtesy lamps.			
04.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, lubrication and cooling systems.-The student will be able to:			
General			
04.01 Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.910.RI.1.3; 2.4; 3.7	
04.02 Verify operation of the instrument panel engine warning indicators.	P-1		
04.03 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-1		
04.04 Install engine covers using gaskets, seals and sealers as required.	P-1		
04.05 Verify engine mechanical timing.	P-2		
04.06 Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	P-1		
04.07 Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
04.08 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.910.W.2.6 LAFS.910.L.1.2C	
Cylinder Head and Valve Train			
04.09 Adjust valves (mechanical or hydraulic lifters).	P-3		
04.10 Identify components of the cylinder head and valve train.	P-1		
Lubrication and Cooling Systems			
04.11 Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine necessary action.	P-1		SC.912.P.8.8; 10.5
04.12 Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1		
04.13 Remove, inspect, and replace thermostat and gasket/seal.	P-1		
04.14 Inspect and test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1		SC.912.P.8.8
04.15 Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as require.	P-1		
04.16 Identify components of the lubrication and cooling systems.	P-1		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Maintenance and Light Repair 2**
Course Number: **9504120**
Course Credit: **1**

It is <u>strongly recommended</u> that the following scope, sequence, and course recommendations be followed.

Recommended Prerequisite: **Automotive Maintenance and Light Repair 1**
Recommended Grade Level: **10th**
Recommended Credits: **1**

Course Description:
The Automotive Maintenance and Light Repair 2 course prepare students for entry into Automotive Maintenance and Light Repair 3. Students study automotive general electrical systems, starting and charging systems, batteries, lighting, instrument cluster, driver information, and body electrical systems. Content emphasizes beginning transportation service skills and workplace success skills.

For every task in Automotive Maintenance and Light Repair 2, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
EE = Electrical/Electronic Systems

EE Task List:	
	P-1 = 26
	P-2 = 10
	P-3 = 2
Total	**38**

CTE Standards and Benchmarks	**Priority Number**	**FS-M/LA**	**NGSSS-Sci**
05.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, instrument cluster, driver information, and body electrical systems.-The student will be able to:			
General			
05.01 Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.910.RI.1.3; 2.4; 3.7	
05.02 Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1	MAFS.912.A-CED.1.1, 2, 4	SC.912.P.10.15

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.03 Use wiring diagrams to trace electrical/electronic circuits.	P-1		
05.04 Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.	P-1	MAFS.912.A-CED.1.1, 2, 4	SC.912.P.10.15
05.05 Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1		SC.912.P.10.15
05.06 Use a test light to check operation of electrical circuits.	P-2		
05.07 Use fused jumper wires to check operation of electrical circuits.	P-2		
05.08 Measure key-off battery drain (parasitic draw).	P-1		SC.912.P.10.15
05.09 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.	P-1		SC.912.P.10.15
05.10 Repair and/or replace connectors, terminal ends, and wiring of electrical/electronic systems (including solder repair)	P-1		
05.11 Identify electrical/electronic system components and configuration.	P-1		
05.12 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.910.W.2.6 LAFS.910.L.1.2C	
Battery Service			
05.13 Perform battery state-of-charge test; determine necessary action.	P-1		
05.14 Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine necessary action.	P-1		
05.15 Maintain or restore electronic memory functions.	P-1		
05.16 Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1		
05.17 Perform slow/fast battery charge according to manufacturer's recommendations.	P-1		
05.18 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1		
05.19 Identify safety precautions for high voltage systems on electric, hybrid-electric, and diesel vehicles.	P-2		
05.20 Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.21 Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.	P-2		
Starting System			
05.22 Perform starter current draw tests; determine necessary action.	P-1	MAFS.912.A-CED.1.1, 2, 4	SC.912.P.10.15
05.23 Perform starter circuit voltage drop tests; determine necessary action.	P-1	MAFS.912.A-CED.1.1, 2, 4	SC.912.P.10.15
05.24 Inspect and test starter relays and solenoids; determine necessary action.	P-2		SC.912.P.10.16, 17
05.25 Remove and install starter in a vehicle.	P-1		
05.26 Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.	P-2		SC.912.P.10.15
05.27 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-3		
Charging System			
05.28 Perform charging system output test; determine necessary action.	P-1	MAFS.912.A-CED.1.1, 2, 4	SC.912.P.10.15
05.29 Inspect, adjust, and/or replace generator (alternator) drive belts, check pulleys, and tensioners for wear; check pulley and belt alignment.	P-1		
05.30 Remove, inspect, and/or replace generator (alternator).	P-2		
05.31 Perform charging circuit voltage drop test; determine necessary action.	P-2	MAFS.912.A-CED.1.1, 2, 4	SC.912.P.10.15
Lighting, Instrument Cluster, Driver Information, and Body Electrical Systems			
05.32 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1		
05.33 Aim headlights.	P-2		
05.34 Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2		
05.35 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1		
05.36 Remove and reinstall door panel.	P-1		
05.37 Describe the operation of keyless entry/remote-start systems.	P-3	LAFS.910.W.1.2A ,B, C, D, E, F LAFS.910.L.1.2C	
05.38 Verify operation of instrument panel gauges and warning /indicator lights; reset maintenance indicators.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.39 Verify windshield wiper and washer operation, replace wiper blades.	P-1		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Maintenance and Light Repair 3**
Course Number: **9504130**
Course Credit: **1**

It is <u>strongly recommended</u> that the following scope, sequence, and course recommendations be followed.

Recommended Prerequisite: **Automotive Maintenance and Light Repair 1 & 2**
Recommended Grade Level: **11th**
Recommended Credits: **1**

Course Description:
The Automotive Maintenance and Light Repair 3 course prepare students for entry into Automotive Maintenance and Light Repair 4. Students study and service suspension and steering systems, and brake systems. Content emphasizes beginning transportation service skills and workplace success skills.

For every task in Automotive Maintenance and Light Repair 3, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
SS = Suspension and Steering
BR = Brakes

SS Task List:	
P-1 =	**29**
P-2 =	**6**
P-3 =	**1**
Total	**36**

BR Task List:	
P-1 =	**29**
P-2 =	**5**
P-3 =	**3**
Total	**37**

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.-The student will be able to:			
General			
06.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.1112.RI.1.3;2.4 ; 3.7	
06.02 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.03 Identify suspension and steering system components and configurations.	P-1		
06.04 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4	
Related Suspension and Steering Service			
06.05 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.	P-1		
06.06 Inspect power steering fluid level and condition.	P-1		SC.912.P.8.2
06.07 Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2		
06.08 Inspect for power steering fluid leakage.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
06.09 Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1		
06.10 Inspect and replace power steering hoses and fittings.	P-2		
06.11 Inspect pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-1		
06.12 Inspect tie rod ends (sockets), tie rod sleeves, and clamps.	P-1		
06.13 Inspect upper and lower control arms, bushings, and shafts.	P-1		
06.14 Inspect and replace rebound bumpers.	P-1		
06.15 Inspect track bar, strut rods/radius arms and related mounts and bushings.	P-1		
06.16 Inspect upper and lower ball joints (with or without wear indicators).	P-1		
06.17 Inspect suspension system coil springs and spring insulators (silencers).	P-1		
06.18 Inspect suspension system torsion bars and mounts.	P-1		
06.19 Inspect and/or replace front stabilizer bar (sway bar) bushings, brackets, and links.	P-1		
06.20 Inspect, remove, and/or replace strut cartridge or assembly; inspect mounts and bushings.	P-2		
06.21 Inspect front strut bearing and mount.	P-1		
06.22 Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.23 Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts and mounts.	P-1		
06.24 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1		
06.25 Inspect electric power steering assist system.	P-2		
06.26 Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2	LAFS.1112.RI.1.1	
06.27 Describe the function of suspension and steering control systems and components, (i.e. active suspension, and stability control).	P-3	LAFS.1112.W.1.2A, B, C, D, E, F; 2.6 LAFS.1112.L.1.2B	
06.28 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.			
Wheel Alignment			
06.29 Perform pre-alignment inspection; measure vehicle ride height.	P-1	MAFS.912.G-C0.1.1	
06.30 Describe alignment angles (camber, caster and toe)	P-1		
06.31 Identify alignment related symptoms such as wander, drift and pull.			
06.32 Measure front and rear wheel camber; adjust as needed.		MAFS.912.G-C0.1.1	
06.33 Measure caster; adjust as needed.		MAFS.912.G-C0.1.1	
06.34 Measure front wheel toe; adjust as needed.		MAFS.912.G-C0.1.1	
06.35 Center the steering wheel using mechanical methods.			
06.36 Measure rear wheel toe, adjust as needed.		MAFS.912.G-C0.1.1	
06.37 Measure thrust angle.		MAFS.912.G-C0.1.1	
06.38 Calibrate steering angle sensor.			
Wheels and Tires			
06.39 Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
06.40 Rotate tires according to manufacturer's recommendations including vehicles equipped with tire pressure monitoring systems (TPMS).	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.41 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1		
06.42 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1		
06.43 Inspect tire and wheel assembly for air loss; determine necessary action.	P-1		
06.44 Repair tire following vehicle manufacturer approved procedure.	P-1		
06.45 Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1	LAFS.1112.RI.1.1	
06.46 Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure.	P-1		
07.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, and related (wheel bearings, parking brake, electrical, etc.) systems.-The student will be able to:			
General			
07.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.1112.RI.1.3; 2.4; 3.7	
07.02 Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1	LAFS.1112.SL.2.4, 6	
07.03 Install wheel and torque lug nuts.	P-1	MAFS.912.N-Q.1.1	
07.04 Identify brake system components and configuration.	P-1		
07.05 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4, 6	
Hydraulic System			
07.06 Describe proper brake pedal height, travel, and feel.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.N-Q.1.1	
07.07 Check master cylinder for external leaks and proper operation.	P-1		
07.08 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.	P-1		
07.09 Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1		SC.912.P.8.2
07.10 Identify components of hydraulic brake warning light system.	P-3	LAFS.1112.RI.1.1	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
07.11 Bleed and/or flush brake system.	P-1		
07.12 Test brake fluid for contamination.	P-1		SC.912.P.8.2
07.13 Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).			
Drum Brakes			
07.14 Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1	MAFS.912.N-Q.1.1	
07.15 Refinish brake drum and measure final drum diameter; compare with specification.	P-1	LAFS.1112.RI.1.2 MAFS.912.N-Q.1.1	
07.16 Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.	P-1		
07.17 Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2		
07.18 Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.	P-1		
Disc Brakes			
07.19 Remove and clean caliper assembly; inspect for leaks and damage/wear; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
07.20 Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
07.21 Remove, inspect, and/or replace brake pads and retaining hardware; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
07.22 Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks.	P-1		
07.23 Clean and inspect rotor and mounting surface, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.N-Q.1.1	
07.24 Remove and reinstall/replace rotor.	P-1		
07.25 Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1	MAFS.912.N-Q.1.1	
07.26 Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1	MAFS.912.N-Q.1.1	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
07.27 Retract and re-adjust caliper piston on an integral parking brake system.	P-2		
07.28 Check brake pad wear indicator; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
07.29 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation.	P-1	LAFS.1112.W.2.4, 6	SC.912.P.10.1
Power-Assist Units			
07.30 Check brake pedal travel with, and without, engine running to verify proper power booster operation.	P-2		
07.31 Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.	P-1		
Related Systems (Wheel Bearings, Parking Brakes, Electrical, Etc.)			
07.32 Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-1		
07.33 Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-2		
07.34 Check parking brake operation and parking brake indicator light system operation; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
07.35 Check operation of brake stop light system.	P-1		SC.912.P.10.15
07.36 Replace wheel bearing and race.	P-2		
07.37 Inspect and replace wheel studs.	P-1		
Electronic Brakes, Traction Control, and Stability Control Systems			
07.38 Identify traction control/vehicle stability control system components.	P-3		
07.39 Describe the operation of a regenerative braking system.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Maintenance and Light Repair 4**
Course Number: **9504140**
Course Credit: **1**

It is <u>strongly recommended</u> that the following scope, sequence, and course recommendations be followed.

Recommended Prerequisite: **Automotive Maintenance and Light Repair 1, 2, & 3**
Recommended Grade Level: **12th**
Recommended Credits: **1**

Course Description:
The Automotive Maintenance and Light Repair IV prepare students for entry into the automotive workforce or into post- secondary training. Student's study and service automotive HVAC systems, engine performance systems, automatic and manual transmission/transaxle systems, as well as practice workplace soft skills.

For every task in Automotive Maintenance and Light Repair 4, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
HA = Heating and Air Conditioning
EP = Engine Performance
AT = Automatic Transmission/Transaxle
MD = Manual Drive Train and Axles

HA Task List:	
P-1 =	6
P-2 =	2
P-3 =	0
Total	8

EP Task List:	
P-1 =	8
P-2 =	7
P-3 =	0
Total	15

AT Task List:	
P-1 =	6
P-2 =	3
P-3 =	2
Total	11

MD Task List:	
P-1 =	9
P-2 =	5
P-3 =	1
Total	15

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
08.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, heating, ventilation, and engine cooling, operating and related control systems.-The student will be able to:			
General			
08.01 Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.1112.RI.1.3;2.4 3.7	
08.02 Identify heating, ventilation and air conditioning (HVAC) components and configuration.	P-1		
08.03 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4	
Refrigeration System Components			
08.04 Inspect and replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine necessary action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
08.05 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2	LAFS.1112.RI.1.1;2.4 LAFS.1112.L.1.2B, LAFS.1112.W.2.4	
08.06 Inspect A/C condenser for airflow restrictions; determine necessary action.	P-1		
Heating, Ventilation, and Engine Cooling Systems			
08.07 Inspect engine cooling and heater system hoses and pipes; determine necessary action.	P-1		
Operating Systems and Related Controls			
08.08 Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; determine necessary action.	P-1		
08.09 Identify the source of A/C system odors.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
09.0 Explain and apply proficiently the diagnosis, service and repair of engine computerized controls, fuel, air induction, exhaust, and emission control systems.-The student will be able to:			
General			
09.01 Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.1112.RI.1.3;2.4 3.7	
09.02 Perform engine absolute manifold pressure tests (vacuum/boost); document results.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
09.03 Perform cylinder power balance test; document results.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
09.04 Perform cylinder cranking and running compression tests; document results.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
09.05 Perform cylinder leakage test; document results.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
09.06 Verify engine operating temperature.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.12.11
09.07 Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1		
Computerized Controls			
09.08 Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1	LAFS.1112.RI.1.2 LAFS.1112.W.2.4	
09.09 Describe the use of the OBD monitors for repair verification.	P-1	LAFS.1112.RI.2.4	
Fuel, Air Induction, and Exhaust Systems			
09.10 Replace fuel filter(s) where applicable.	P-2		
09.11 Inspect, service or replace air filters, filter housings, and intake duct work.	P-1		
09.12 Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.	P-1		
09.13 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine necessary action.	P-1		
09.14 Check and refill diesel exhaust fluid (DEF).	P-2		SC.912.P.8.2
Emissions Control Systems			
09.15 Inspect, test, and service positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform necessary action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
10.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of in-vehicle and off-vehicle automatic transmissions/transaxles.-The student will be able to:			
General			
10.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.1112.RI.1.3;2.4 3.7	SC.912.P.8.2

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
10.02 Check fluid level in a transmission or a transaxle equipped with a dipstick.	P-1		
10.03 Check fluid level in a transmission or a transaxle not equipped with a dipstick.	P-1		
10.04 Check transmission fluid condition; check for leaks.	P-2		SC.912.P.8.2
10.05 Identify drive train components and configuration.	P-1		
10.06 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4	
In-Vehicle Transmission/Transaxle			
10.07 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-2		
10.08 Inspect for leakage at external seals, gaskets, and bushings.	P-1		
10.09 Inspect, replace, and/or align power train mounts.	P-2		
10.10 Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1		
Off-Vehicle Transmission and Transaxle			
10.11 Describe the operational characteristics of a continuously variable transmission (CVT).	P-3	LAFS.1112.W.2.4 LAFS.1112.L.1.2B	
10.12 Describe the operational characteristics of a hybrid vehicle drive train.	P-3	LAFS.1112.W.2.4 LAFS.1112.L.1.2B	
11.0 Explain and apply proficiently the diagnosis, service and repair of manual drivetrain, clutches, transmissions/transaxles, drive and half-shafts, universal and constant velocity joints, differential case assemblies, drive axles, four-wheel and all-wheel drive systems.-The student will be able to:			
General			
11.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1	LAFS.1112.RI.1.3;2.4 3.7	
11.02 Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1		
11.03 Check fluid condition; check for leaks.	P-2		SC.912.P.8.2
11.04 Identify manual drive train and axle components and configuration.	P-1		
11.05 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
Clutch			
11.06 Check and adjust clutch master cylinder fluid level; use proper fluid type per manufacturer specification	P-1		
11.07 Check for hydraulic system leaks.	P-1		
Transmission/Transaxle			
11.08 Describe the operational characteristics of an electronically controlled manual transmission/transaxle.	P-2	LAFS.1112.W.2.4 LAFS.1112.L.1.2B	
Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints (Front, Rear, All, and Four-wheel drive)			
11.09 Inspect, remove, and/or replace bearings, hubs, and seals.	P-2		
11.10 Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-2		
11.11 Inspect locking hubs.	P-3		
11.12 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-2		
Differential Case Assembly			
11.13 Clean and inspect differential case; check for leaks; inspect housing vent.	P-1		
11.14 Check and adjust differential case fluid level; use proper fluid type per manufacturer specification.	P-1		SC.912.P.8.2
11.15 Drain and refill differential housing.	P-1		
11.16 Inspect and replace drive axle wheel studs.	P-1		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Maintenance and Light Repair 5**
Course Number: **9504150**
Course Credit: **1**

It is <u>strongly recommended</u> that the following scope, sequence, and course recommendations be followed.

Recommended Prerequisite: **Automotive Maintenance and Light Repair 1, 2 & 3**
***Students enrolled in Automotive Maintenance and Light Repair 5 should also be enrolled in or have successfully completed Automotive Maintenance and Light Repair 3. Automotive Maintenance and Light Repair 5 expands on tasks highlighted in Automotive Maintenance and Light Repair 1, 2, & 3.**

Recommended Grade Level: **11th/12th**
Recommended Credits: **1**

Course Description:
The Automotive Maintenance and Light Repair 5 prepare students for entry into the automotive workforce or into post- secondary training. Student's study and service automotive engine repair, electrical/electronic systems, suspension and steering systems, brakes as well as practice workplace soft skills.

For every task in Automotive Maintenance and Light Repair 5 the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
ER = Engine Repair
EE = Electrical/Electronics
SS = Suspension and Steering
BR = Brakes

ER Task List:	
P-1 =	9
P-2 =	6
P-3 =	1
Total	16

EE Task List:	
P-1 =	5
P-2 =	4
P-3 =	6
Total	15

SS Task List:	
P-1 =	11
P-2 =	18
P-3 =	9
Total	38

BR Task List:	
P-1 =	11
P-2 =	3
P-3 =	2
Total	16

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
12.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.- The student will be able to:			
General: Engine Diagnosis; Removal and Reinstallation (R & R)			
12.01 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1	LAFS.1112.W.1.2A, B, C, D, E, F; 2.4, 6 LAFS.1112.L.1.1B	
12.02 Research applicable vehicle and service information, including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1		
12.03 Inspect, remove and replace engine mounts.	P-2		
12.04 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4, 6	
12.05 Identify and interpret engine concern; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.06 Locate and interpret vehicle and major component identification numbers.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.07 Diagnose engine noises and vibrations; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.08 Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.09 Perform engine vacuum tests; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.10 Perform cylinder power balance tests; determine necessary action.			
12.11 Perform cylinder cranking and running compression tests; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.12 Perform cylinder leakage tests; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
Cylinder Head and Valve Train Diagnosis and Repair			
12.13 Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1	LAFS.1112.RI.1.1, LAFS.1112.L.3.4A, B, C, D; 3.6	
12.14 Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1		
12.15 Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
12.16 Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.	P-1		
12.17 Establish camshaft position sensor indexing.	P-1		
Engine Block Assembly Diagnosis and Repair			
12.18 Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-2		
12.19 Remove and replace piston pin; where applicable.			
Lubrication and Cooling Systems Diagnosis and Repair			
12.20 Identify causes of engine overheating.	P-1	LAFS.1112.RI.1.1	
12.21 Inspect, remove and replace water pump.	P-2		
12.22 Remove and replace radiator.	P-2		
12.23 Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1		
12.24 Perform oil pressure tests; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.25 Inspect auxiliary coolers; determine necessary action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
12.26 Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2		SC.912.P.10.1, 4
12.27 Inspect and replace engine cooling and heater system hoses.			
13.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.-The student will be able to:			
General: Electrical System Diagnosis			
13.01 Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.	P-1		
13.02 Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
13.03 Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 15
13.04 Identify and interpret electrical/electronic system concern; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
13.05 Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.		LAFS.1112.RI.1.1 LAFS.1112.RL.2.4	
Battery Diagnosis and Service			
13.06 Perform battery conductance test; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
Starting System Diagnosis and Repair			
13.07 Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.	P-2		SC.912.P.10.13, 14, 15
Charging System Diagnosis and Repair			
13.08 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
Lighting Systems Diagnosis and Repair			
13.09 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
13.10 Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
Instrument Cluster and Driver Information Systems Diagnosis and Repair			
13.11 Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
13.12 Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.A-CED.1.4	
13.13 Reset maintenance indicators as required.	P-2		
13.14 Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
Body Electrical Systems Diagnosis and Repair			
13.15 Describe operation of comfort and convenience accessories and related circuits (such as: power window, power seats, pedal height, power locks, truck locks, remote start, moon roof, sun roof, sun	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
	shade, remote keyless entry, voice activation, steering wheel controls, back-up camera, park assist, cruise control, and auto dimming headlamps); determine needed repairs.			
13.16	Describe operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed repairs.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
13.17	Describe operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
13.18	Describe operation of safety systems and related circuits (such as: horn, airbags, seat belt pre-tensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, park assist, and back-up camera); determine needed repairs.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
13.19	Describe body electronic systems circuits using a scan tool; check for module communication errors (data bus systems); determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.A-CED.1.4	SC.912.P.10.13, 14, 15
13.20	Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
13.21	Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
13.22	Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.0	Explain and apply proficiently the diagnosis, service and repair of front and rear suspension and steering systems, wheel alignment diagnosis and adjustment, and wheels and tires.-The student will be able to:			
General: Suspension and Steering Systems				
14.01	Identify and interpret suspension and steering system concerns; determine needed action.	P-2		
Steering Systems Diagnosis and Repair				
14.02	Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1		
14.03	Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.04	Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
14.05 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.06 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.07 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2		
14.08 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1		
14.09 Inspect for power steering fluid leakage; determine needed action.	P-1		
14.10 Remove and reinstall power steering pump.	P-2		
14.11 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2		
14.12 Inspect, remove, and/or replace power steering hoses and fittings.	P-2		
14.13 Inspect, remove, and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2		
14.14 Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1		
14.15 Identify non-rack and pinion worm bearing preload and sector lash.			
Suspension Systems Diagnosis and Repair			
14.16 Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.17 Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.18 Inspect, remove and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3		
14.19 Inspect, remove and/or replace strut rods and bushings.	P-3	LAFS.1112.W.2.4, 6	
14.20 Inspect, remove and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2		
14.21 Inspect, remove and/or replace steering knuckle assemblies.	P-3	LAFS.1112.W.2.4, 6	
14.22 Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
14.23 Inspect, remove and/or replace torsion bars and mounts.	P-3		
14.24 Inspect, remove and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3		
14.25 Inspect, remove and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3		
14.26 Inspect, remove and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3		
Related Suspension and Steering Service			
14.27 Remove, inspect, and service and/or replace front and rear wheel bearings.	P-1	LAFS.1112.W.2.4, 6	
Wheel Alignment Diagnosis, Adjustment, and Repair			
14.28 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.29 Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1		
14.30 Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel.	P-1	MAFS.912.G-CO.1.1	
14.31 Check toe-out-on-turns (turning radius); determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.32 Check steering axis inclination (SAI) and included angle; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.33 Check rear wheel thrust angle; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.G-CO.1.1	
14.34 Check for front wheel setback; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.35 Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.36 Reset steering angle sensor	P-2		
Wheels and Tires Diagnosis and Repair			
14.37 Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
14.38 Measure wheel, tire, axle flange, and hub run out; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
14.39 Diagnose tire pull problems; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.-The student will be able to:			
General: Brake Systems Diagnosis			
15.01 Identify and interpret brake system concern; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.02 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
Hydraulic System Diagnosis and Repair			
15.03 Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1		
15.04 Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1		
15.05 Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1		
15.06 Remove, bench bleed, and reinstall master cylinder.	P-1		
15.07 Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.08 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action.	P-1		
15.09 Replace brake lines, hoses, fittings, and supports.	P-2		
15.10 Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2	MAFS.912.G-CO.1.1	
15.11 Inspect, test, and/or replace components of brake warning light system.	P-3	LAFS.1112.RI.1.3;2.4	
15.12 Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.		LAFS.1112.RI.1.3;2.4	
Drum Brake Diagnosis and Repair			
15.13 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.14 Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.		MAFS.912.N-Q.1.1	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
Disc Brake Diagnosis and Repair			
15.15 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.16 Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.			
15.17 Install wheel, torque lug nuts, and make final checks and adjustments associated with disc brakes.		MAFS.912.N-Q.1.1	
Power-Assist Units Diagnosis and Repair			
15.18 Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.19 Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.20 Measure and adjust master cylinder pushrod length.	P-3		
Related Systems (Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair			
15.21 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.22 Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1		
Electronic Brake Control Systems: Antilock Brakes (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair			
15.23 Identify and inspect electronic brake control system components (ABS, TCS, and ESC); determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
15.24 Remove and install electronic brake control system electrical/electronic and hydraulic components.			

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Maintenance and Light Repair 6**
Course Number: **9504160**
Course Credit: **1**

It is <u>strongly recommended</u> that the following scope, sequence, and course recommendations be followed.

Recommended Prerequisite: **Automotive Maintenance and Light Repair 1, 2, 3, 4, & 5**
***Students enrolled in Automotive Maintenance and Light Repair 6 should also be enrolled in or have successfully completed Automotive Maintenance and Light Repair 4. Automotive Maintenance and Light Repair 6 expands on tasks highlighted in Automotive Maintenance and Light Repair 4.**

Recommended Grade Level: **11th/12th**
Recommended Credits: **1**

Course Description:
The Automotive Maintenance and Light Repair 6 prepare students for entry into the automotive workforce or into post- secondary training. Student's study and service automotive heating and air conditioning, engine performance, automatic transmission/transaxles, manual drive train and axles, as well as practice workplace soft skills.

For every task in Automotive Maintenance and Light Repair 6 the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
HA = Heating and Air Conditioning
EP = Engine Performance
AT = Automatic Transmission/Transaxle
MD = Manual Drivetrain and Axles

HA Task List:	EP Task List:	AT Task List:	MD Task List:
P-1 = 12	P-1 = 13	P-1 = 5	P-1 = 11
P-2 = 12	P-2 = 12	P-2 = 6	P-2 = 8
P-3 = 4	P-3 = 7	P-3 = 2	P-3 = 4
Total 28	Total 32	Total 13	Total 23

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
16.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, heating, ventilation, engine cooling, operating and related control systems, refrigerant recovery, and recycling and handling.- The student will be able to:			
General: A/C System Diagnosis and Repair			
16.01 Identify and interpret heating and air conditioning problems; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.02 Performance test A/C system; identify problems.	P-1		
16.03 Identify abnormal operating noises in the A/C system; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.04 Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1	LAFS.1112.W.2.4, 6; 4.10 LAFS.1112.L.1.2B, LAFS.1112.RI.3.7	
16.05 Leak test A/C system; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.06 Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.07 Determine recommended oil and oil capacity for system application.	P-1	LAFS.1112.RI.1.1;2.4 3.7	SC.912.P.8.1, 2
16.08 Using a scan tool, observe and record related HVAC data and trouble codes.	P-3	LAFS.1112.W.2.4 LAFS.1112.L.1.2B	
16.09 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.		LAFS.1112.RI.2.4	
Refrigeration System Component Diagnosis and Repair			
16.10 Inspect, remove, and/or replace A/C compressor drive belts, pulleys, and tensioners; visually inspect A/C components for signs of leaks; determine needed action.	P-1		
16.11 Inspect, test, service, and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2		
16.12 Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil type and quantity.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.13 Determine need for an additional A/C system filter; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.14 Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
16.15 Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
16.16 Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1		
16.17 Inspect evaporator housing water drain; determine needed action.	P-1		
16.18 Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2	LAFS.1112.RI.3.7 LAFS.1112.L.3.4C	
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair			
16.19 Inspect and test heater control valve(s); determine needed action.	P-2		
16.20 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2		
16.21 Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.			
16.22 Inspect, test, and replace thermostat and gasket/seal.			
16.23 Determine coolant condition and coolant type for vehicle application; drain and recover coolant.			
16.24 Flush system; refill system with recommended coolant; bleed system.			SC.912.P.8.2
16.25 Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.			
16.26 Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.A-CED.1.4	SC.912.P.10.13, 14, 15
Operating Systems and Related Controls Diagnosis and Repair			
16.27 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1	MAFS.912.A-CED.1.4	SC.912.P.10.13, 14, 15
16.28 Diagnose HVAC system clutch control systems; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.A-CED.1.4	SC.912.P.10.13, 14, 15
16.29 Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.A-CED.1.4	SC.912.P.10.13, 14, 15
16.30 Inspect and test HVAC system control panel assembly; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.A-CED.1.4	SC.912.P.10.13, 14, 15

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
16.31 Inspect and test HVAC system control cables, motors, and linkages; determine needed action.	P-3		SC.912.P.10.13, 14, 15
16.32 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
Refrigerant Recovery, Recycling, and Handling			
16.33 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1		
16.34 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1		
16.35 Recycle, label, and store refrigerant.	P-1		
17.0 Explain and apply proficiently the diagnosis, service and repair of engines, computerized controls, ignition, fuel, air induction, exhaust, and emission control systems.-The student will be able to:			
General: Engine Diagnosis			
17.01 Identify and interpret engine performance concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.02 Diagnose abnormal engine noise or vibration concerns; determine necessary action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.03 Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine necessary action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.04 Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3		
17.05 Diagnose the cause of excessive oil consumption coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2		
17.06 Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1		
17.07 Perform cylinder power balance test; determine needed action.	P-2		
17.08 Perform cylinder cranking and running compression tests; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
17.09 Perform cylinder leakage test; determine needed action.	P-1		
17.10 Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2		
17.11 Verify engine operating temperature; determine needed action.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
17.12 Verify correct camshaft timing including variable valve timing (VVT) systems.	P-1		
17.13 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.14 Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.15 Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.		LAFS.1112.RI.2.4	SC.912.P.8.2, 8
Computerized Controls Diagnosis and Repair			
17.16 Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1		
17.17 Perform active tests of actuators using a scan tool; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.18 Check for module communication (including CAN/BUS systems) errors using a scan tool.			
Ignition System Diagnosis and Repair			
17.19 Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.20 Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1	LAFS.1112.RI.2.4	SC.912.P.10.13, 14, 15
17.21 Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3	LAFS.1112.RI.2.4	
17.22 Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1		
17.23 Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.		LAFS.1112.RI.2.4	SC.912.P.10.13, 14, 15
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair			
17.24 Check fuel for contaminants; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.8.2
17.25 Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; determine needed action.	P-1	LAFS.1112.RI.2.4	
17.26 Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2		
17.27 Inspect, test and/or replace fuel injectors.	P-2	LAFS.1112.RI.2.4	SC.912.P.10.13, 14, 15

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
17.28 Verify idle control operation.	P-1		
17.29 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1		
17.30 Perform exhaust system back-pressure test; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
Emissions Control Systems Diagnosis and Repair			
17.31 Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
17.32 Inspect, test, service and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action.	P-2	LAFS.1112.RI.2.4	
17.33 Diagnose emissions and drive-ability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) system; determine needed action.	P-3	LAFS.1112.RI.2.4	
17.34 Inspect and test electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-3	LAFS.1112.RI.2.4	SC.912.P.10.13, 14, 15
17.35 Inspect and test components and hoses of the evaporative emissions control (EVAP) system; determine needed action.	P-1	LAFS.1112.RI.2.4	SC.912.P.8.2
17.36 Diagnose emissions and drive-ability concerns caused by the catalytic converter system; determine needed action.	P-3	LAFS.1112.RI.2.4	
17.37 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2	LAFS.1112.RI.2.4	
17.38 Inspect and test mechanical components of secondary air injection systems; perform necessary action.		LAFS.1112.RI.2.4	
17.39 Adjust valves on engines with mechanical or hydraulic lifters; as applicable.			
17.40 Remove and replace timing belt; verify correct camshaft timing.			
17.41 Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.		LAFS.1112.RI.2.4	
17.42 Inspect engine oil and/or filter for condition and determine necessary action.			
17.43 Identify hybrid vehicle internal combustion engine service precautions.		LAFS.1112.RI.1.1	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
18.0 Explain and apply proficiently the diagnosis, service, maintenance, repair and overhaul of in-vehicle and off-vehicle automatic transmissions/transaxles.-The student will be able to:			
General: Transmission and Transaxle Diagnosis			
18.01 Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
18.02 Diagnose fluid loss and condition concerns; determine needed action.	P-1		
18.03 Demonstrate knowledge of pressure test including transmissions/transaxles equipped with electronic pressure control.	P-3		
18.04 Perform stall test; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
18.05 Perform lock-up converter system tests; determine needed action.	P-3	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	SC.912.P.10.13, 14, 15
18.06 Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1		
18.07 Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-2		
18.08 Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2		
In-Vehicle Transmission/Transaxle Maintenance and Repair			
18.09 Inspect for leakage; replace external seals, gaskets, and bushings.	P-2		
18.10 Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of relearn procedure.	P-1		SC.912.P.10.13, 14, 15
18.11 Diagnose electronic transmission control systems using a scan tool; determine necessary action.		LAFS.1112.RI.2.4	
Off-Vehicle Transmission and Transaxle Repair			
18.12 Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.	P-2		
18.13 Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
18.14 Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2		
18.15 Install and seat torque converter to engage drive/splines.			
18.16 Inspect bands and drums; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.0 Explain and apply proficiently the diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, ring and pinion gears, differential case assembly, and drive axles.-The student will be able to:			
General: Drive Train Diagnosis			
19.01 Identify and interpret drive train concern; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.02 Check fluid condition; check for leaks; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
Clutch Diagnosis and Repair			
19.03 Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.04 Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.05 Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-1		
19.06 Bleed clutch hydraulic system.	P-1		
19.07 Inspect flywheel and ring gear for wear and cracks; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.08 Measure flywheel runout and crankshaft end play; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.09 Describe the operation and service of a system that uses a dual mass flywheel.	P-3		
19.10 Remove and reinstall manual transmission/transaxle.			
19.11 Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.12 Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
Transmission/Transaxle Diagnosis and Repair			
19.13 Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2		
19.14 Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.			
19.15 Inspect, replace, and align powertrain mounts.			
19.16 Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.			
19.17 Remove and replace transaxle final drive.			
19.18 Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.			
19.19 Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.			
19.20 Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.			
19.21 Inspect lubrication devices (oil pump or slingers); perform necessary action.			
19.22 Inspect, test, and replace transmission/transaxle sensors and switches.		LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-wheel, Four-wheel drive)			
19.23 Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B	
19.24 Diagnose universal joint noise and vibration concerns; determine needed action.	P-2		
19.25 Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2	MAFS.912.N-Q.1.1	
19.26 Inspect, service, and replace shaft center support bearings.			
19.27 Diagnose noise and vibration concerns; determine necessary action.			
Drive Axle Diagnosis and Repair			
Ring and Pinion Gears and Differential Case Assembly			
19.28 Drain and refill differential case; using proper fluid type per manufacturer specification.	P-1		
19.29 Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
Drive Axles			
19.30 Inspect and replace drive axle wheel studs.	P-1		
19.31 Remove and replace drive axle shafts.	P-1		
19.32 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2		
19.33 Measure drive axle flange runout and shaft end play; determine needed action.	P-2	LAFS.1112.W.2.4, 6 LAFS.1112.L.1.2B MAFS.912.N-Q.1.1	
19.34 Inspect and reinstall limited slip differential components.			
19.35 Remove and reinstall transfer case.			
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair			
19.36 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3		
19.37 Inspect locking hubs; determine needed action(s).	P-3		
19.38 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3		
19.39 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2		

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

The occupational standards and benchmarks outlined in this secondary program **partially correlate** to the standards and benchmarks of the following postsecondary Automotive Service Technology programs:

Automotive Service Technology - I470608 (0647060405)
Automotive Service Technology 1 - T400700 (0647060411)
Automotive Service Technology 2 - T400800 (0647060412)
Automotive Drivetrain Technician – T400710 (0647060423)
Automotive Electrical Technician – T400720 (0647060424)
Automotive General Service Technician – T400730 (0647060425)
Automotive Maintenance and Light Repair Technician – T404100 (0647060422)
Automotive Performance Technician – T400740 (0647060426)

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)

SkillsUSA is the intercurricular career and technical student organization 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.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Outboard Marine Service Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9504200
CIP Number	0647061612
Grade Level	9 - 12
Standard Length	7 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3051 – Motorboat Mechanics and Service Technicians

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to the following: service, repair and overhaul of four-stroke and two-stroke cycle engines and outboard motors; and service and repair of boating accessories. With regard to the above, course content will include electrical systems, fuel systems, power transfer systems, ignition systems, cooling systems, lubrication systems, drive systems and boat and trailer rigging.

The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices.

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

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9504210 9504220	Outboard Marine Service 1 Outboard Marine Service 2	DIESEL MECH @7 7G GASENG RPR @7 7G	1 credit 1 credit	49-3051 49-3051	3 3	
B	9504230 9504240	Outboard Marine Service 3 Outboard Marine Service 4		1 credit 1 credit	49-3051 49-3051	3 3	
C	9504250 9504260	Advanced Marine Technology 1 Advanced Marine Technology 2		1 credit 1 credit	49-3051 49-3051	3 3	
D	9504270	Outboard Marine Service Capstone 5		1 credit	49-3051	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9504210	1/87 1%	3/80 4%	3/83 4%	6/69 9%	3/67 4%	1/70 1%	2/69 3%	6/82 7%	3/66 5%	11/74 15%	7/72 10%
9504220	1/87 1%	3/80 4%	2/83 2%	4/69 6%	3/67 4%	1/70 1%	2/69 3%	5/82 6%	2/66 3%	9/74 12%	7/72 10%
9504230	3/87 3%	5/80 6%	2/83 2%	7/69 10%	3/67 4%	2/70 3%	3/69 4%	4/82 5%	3/66 5%	10/74 14%	10/72 14%
9504240	3/87 3%	6/80 8%	2/83 2%	9/69 13%	3/67 4%	3/70 4%	3/69 4%	6/82 7%	5/66 8%	8/74 11%	9/72 13%
9504250	1/87 1%	3/80 4%	1/83 1%	4/69 6%	1/67 1%	#	1/69 1%	2/82 2%	1/66 2%	7/74 9%	6/72 8%
9504260	1/87 1%	3/80 4%	1/83 1%	4/69 6%	1/67 1%	#	1/69 1%	3/82 4%	1/66 2%	7/74 9%	6/72 8%
9504270	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504210	2/67 3%	#	1/54 2%	5/46 15%	5/45 16%	#	#
9504220	2/67 3%	#	3/54 6%	15/46 33%	15/45 33%	#	#
9504230	2/67 3%	1/75 1%	#	#	#	4/45 9%	4/45 9%
9504240	2/67 3%	1/75 1%	#	#	#	8/45 18%	8/45 18%
9504250	1/67 1%	#	#	2/46 4%	2/45 4%	2/45 4%	2/45 4%
9504260	1/67 1%	#	#	4/46 9%	4/45 9%	4/45 9%	4/45 9%
9504270	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate an understanding of workplace safety and workplace organization.
02.0 Adjust and repair trailers.
03.0 Use marine woods, metals, and fiberglass.
04.0 Maintain and repair basic two-stroke cycle outboard engines.
05.0 Maintain and repair fuel systems on boats.
06.0 Maintain and repair electrical systems.
07.0 Prepare delivery checklist.
08.0 Maintain and repair outboard capacitor discharge ignition systems.
09.0 Maintain and repair outboard fuel systems.
10.0 Parts specialist and computer skills to industry standards.
11.0 Maintain and repair basic four-stroke cycle outboard engines.
12.0 Maintain and repair outboard charging systems.
13.0 Maintain and repair outboard battery/EFI ignition systems.
14.0 Maintain and repair outboard cranking systems.
15.0 Maintain and repair outboard lubrication systems.
16.0 Maintain and repair outboard cooling systems.
17.0 Maintain and repair outboard lower gear cases.
18.0 Assemble and maintain outboard lower units and housing assemblies.
19.0 Demonstrate employability skills.
20.0 Demonstrate an understanding of entrepreneurship.
21.0 Maintain and repair basic four-stroke cycle inboard gas engine.
22.0 Maintain and repair inboard fuel systems.
23.0 Maintain and repair inboard gas cooling systems.
24.0 Maintain and repair inboard gas lubrication systems.
25.0 Maintain and repair electronic ignition systems.
26.0 Maintain and repair capacitor discharge ignition systems.
27.0 Conceive, design, and present a marine project(s) that encompass all the skills learned in the Outboard Marine Service Technology program.
28.0 Plan, organize, and carry out a project plan.
29.0 Formulate strategies to properly manage resources.
30.0 Use tools, materials, and processes in an appropriate and safe manner.
31.0 Create a project portfolio describing the marine project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results.

Florida Department of Education
Student Performance Standards

Course Title: **Outboard Marine Service 1**
Course Number: **9504210**
Course Credit: **1**

Course Description:
Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of workplace safety and organization, trailer service, various boat materials, 2-stroke cycle outboard engines, and fuel systems on boats.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate an understanding of workplace safety and workplace organization.-The student will be able to:		
01.01	Identify safety requirements for manual, electrical-powered, and pneumatic tools.		
01.02	Demonstrate, apply, and provide evidence of safely using manual, electrical-powered, and pneumatic tools.		
01.03	Identify safety requirements for operation of automated machines and equipment.		
01.04	Demonstrate, apply, and provide evidence of safely operating automated machines and equipment.		
01.05	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.	MAFS.912.N-Q.1.3	
01.06	Read, interpret, and apply service manuals.		
01.07	Identify the safe use of paints, chemicals, fiberglass, and compounds	LAFS.910.RI.1.3 LAFS.910.W.2.4 LAFS.910.L.3.4 MAFS.912.N-Q.1.3	
01.08	Demonstrate, apply, and provide evidence of safely using paints, chemicals, fiberglass, and compounds.		SC.912.P.10.5
01.09	Identify the safe use of electrical connectors and cords.		
01.10	Demonstrate, apply, and provide evidence of safely using electrical connectors and cords.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.11	Identify, demonstrate, apply, and provide evidence of understanding of shop safety rules on an ongoing basis.		
01.12	Demonstrate and identify the proper procedures for extinguishing class A, B, and C type fires.		
01.13	Identify various workplace injuries related to the marine industry.		
01.14	Demonstrate and practice knowledge of first aid and first response procedures appropriate for this course.		
01.15	Identify and apply safety procedures in case of smoke or chemical inhalation.		
01.16	Demonstrate and apply material handling techniques to safely move materials.		
01.17	Demonstrate and apply proper techniques for lifting loads.		
01.18	Research and identify Occupational Safety Health Administration (OSHA) safety standards related to the marine industry.		
01.19	Demonstrate, apply, and provide evidence of understanding Occupational Safety Health Administration (OSHA) safety standards related to the marine industry.		
01.20	Demonstrate knowledge of safety requirements for material handling equipment such as rigging, ladders, and scaffolds related to the marine industry.		
01.21	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.		
01.22	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)		
01.23	Locate Safety Data Sheets (SDS).		
01.24	Demonstrate understanding and knowledge of using and applying the information located on Safety Data Sheets (SDS).		
01.25	Proactively respond to a safety concern and then document occurrences.		
01.26	Identify and report unsafe conditions.		
01.27	Determine the appropriate corrective action after an unsafe condition is identified.		
01.28	Demonstrate knowledge of various emergency alarms and procedures.		
01.29	Demonstrate knowledge and apply clean-up procedures for spills.		
01.30	Identify and apply procedures for handling hazardous material.		
01.31	Perform safety and environmental inspections.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
01.32 Perform leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.		
01.33 Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations.		
01.34 Demonstrate and apply proper equipment shutdown procedures.		
01.35 Identify, select, and use personal protective equipment (PPE).		
01.36 Identify, demonstrate, and apply ergonomic work techniques.		
01.37 Train other students to use and apply safety skills outlined in this standard.		
02.0 Adjust and repair trailers.-The student will be able to:		
02.01 Make boat to trailer adjustments.	MAFS.912.N-Q.1.3	
02.02 Remove and replace lighting systems.		
02.03 Remove, inspect, repack, and replace wheel bearings and springs.		
02.04 Remove and replace brakes.		
02.05 Check lug nuts on trailer for correct torque.		
03.0 Use marine woods, metals, and fiberglass.-The student will be able to:		
03.01 Explain the hazards of a marine environment to woods, metals and fiberglass.	LAFS.910.W.1.2 LAFS.910.SL.2.4 LAFS.910.L.1.1	SC.912.L.17.2, 3
03.02 Explain a galvanic series.	LAFS.910.W.1.2 LAFS.910.SL.2.4 LAFS.910.L.1.1	SC.912.P.10.14
03.03 Explain the theory for using given materials in boat repair activities.	LAFS,910.SL.2.4 LAFS.910.W.3.9 LAFS,910.RI.1.3 LAFS.910.L.1.1	SC.912.P.12.12
04.0 Maintain and repair basic two-stroke cycle outboard engines.-The student will be able to:		
04.01 Explain the basic principles of the operation of two-stroke cycle internal combustion engines.	LAFS.910.W.1.2 LAFS.910.RI.2.4 LAFS.910.SL.2.4	SC.912.P.10.1, 15; 12.2, 3, 11
04.02 Identify types of two-stroke cycle engines.	LAFS.910.W.1.2 LAFS.910.RI.2.4 LAFS.910.SL.2.4	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.03 Locate engine serial and model numbers.		
04.04 Set up and use precision measurement tools.	LAFS.910.W.1.2 LAFS.910.SL.2.4	
04.05 Drill and remove broken studs and install helicoils.		
04.06 Demonstrate appropriate heating techniques and skills.	MAFS.912.N-Q.1.3	
04.07 Identify engine assemblies and systems.		
04.08 Disassemble engines.		SC.912.P.10.1; 12.10, 11
04.09 Remove, clean and inspect heads for cracks, warpage and damaged spark plug threads.		
04.10 Diagnose head problems by use of the visual inspection method.		
04.11 Diagnose head problems by use of the compression tester method.	MAFS.912.N-Q.1.3	
04.12 Diagnose head problems by use of the stethoscope method.	MAFS.912.N-Q.1.3	SC.912.P.12.3
04.13 Remove, clean and inspect piston rods and assemblies.		
04.14 Measure out-of-round of pistons and cylinders.	MAFS.912.N-Q.1.3	
04.15 Hone cylinders.	MAFS.912.N-Q.1.3	
04.16 Check the total bearing surface of connecting rod bearings.		
04.17 Measure piston skirts and ring grooves.		
04.18 Measure the piston ring gap in cylinder bores.		
04.19 Install piston pins according to manufacturer's specifications.		
04.20 Check rod and piston assembly alignment.	MAFS.912.N-Q.1.3	
04.21 Install rings on pistons.		
04.22 Install piston rod assemblies.		
04.23 Measure and check crankshafts with a micrometer.		
04.24 Check needle bearings.		
04.25 Inspect crankshafts and install seal.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.26	Inspect, clean and/or replace reed valves.		
04.27	Reassemble engines.		
05.0	Maintain and repair fuel systems on boats.-The student will be able to:		
05.01	Identify and locate fuel system components (fuel tanks, lines, filters, etc.).	LAFS.910.W.1.2 LAFS.910.SL.2.4	
05.02	Sketch and label the parts of total fuel systems.	LAFS.910.W.1.2	
05.03	Service fuel lines and primer bulbs (vacuum test).		SC.912.P.12.10, 11
05.04	Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.		
05.05	Locate and identify fuel pumps and test the vacuum and pressure.		
05.06	Determine and make appropriate fuel oil mixtures.		

Florida Department of Education
Student Performance Standards

Course Title: **Outboard Marine Service 2**
Course Number: **9504220**
Course Credit: **1**

Course Description:
Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of marine electrical systems, procedures for preparing boats to customers, capacitor discharge ignition systems, outboard engine fuel systems, and proper use of computer systems related to parts specialization.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.0	Maintain and repair electrical systems.-The student will be able to:		
06.01	Locate and match electrical units by their symbols on a wiring diagram.		
06.02	Set up and use voltmeters, ammeters and ohmmeters.		SC.912.P.10.13,14, 15
06.03	Locate and identify electrical circuit components.	LAFS.910.W.1.2	
06.04	Sketch a typical circuit using a single wire system.		
06.05	Test storage batteries using proper industry recognized battery testing equipment.		SC.912.P.10.13
06.06	Charge storage batteries.		
06.07	Remove and replace batteries and service battery boxes.		
06.08	Repair damaged wire and electrical harnesses.		
06.09	Diagnose circuit troubles using continuity or a test light and low reading voltmeters to record voltage drop.		
06.10	Sketch and label typical fuel gauge systems.	LAFS.910.W.1.2	
06.11	Remove and replace gauges or indicating lights.		
06.12	Remove and replace fuel-sending units.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.13 Diagnose gages and accessory system troubles using voltmeters, ammeters or detached sending units.		
06.14 Sketch typical circuits such as those for auto bilge pumps or navigation lights.		
06.15 Locate opens, shorts and grounds.	LAFS.910.W.1.2	
06.16 Demonstrate proficiency in applying industry standard wire terminal practices.		SC.912.P.10.2
06.17 Demonstrate proper installation of 2 position and 3 position battery switches.		SC.912.P.8.2; 10.4
06.18 Demonstrate correct procedure for connecting batteries in series and parallel.		
06.19 Check alternator output voltage with engine running compare with specifications.		
07.0 Prepare delivery checklist.-The student will be able to:		
07.01 Make center line measurements for outboard motor installation.	MAFS.912.N-Q.1.3 MAFS.912.G-CO.1.1; 4.12	
07.02 Locate manufacturers' I.D. plates.		
07.03 Mount control boxes at the helm.	MAFS.912.N-Q.1.3	
07.04 Place wiring and cables in a neat and orderly manner.		
07.05 Adjust the control cables from the engine to the control box.		
07.06 Center the steering cable to the engine.		
07.07 Find suitable locations for accessories and mount them to the boat.	MAFS.912.N-Q.1.3	
07.08 Lubricate shafts, install propellers and fasten both securely.		
07.09 Check for proper levels.		
07.10 Check manufacturers' specifications.	LAFS.910.RI.2.4, 5 LAFS.910.L.2.3	
07.11 Describe how to or test-run boats.		
07.12 Recheck work completed.		
07.13 Demonstrate proper procedures for checking oil level capacity.		
07.14 Install or connect drain plugs, petcocks, hose clamps, hoses, etc.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.15 Remove and replace running lights.		
	07.16 Troubleshoot lighting systems and accessories.		
	07.17 Check and adjust throttles, cables, horns, lights and tachometers.		
	07.18 Check steering system for proper operation.		
08.0	Maintain and repair outboard capacitor discharge ignition systems.-The student will be able to:		
	08.01 Sketch and label electrical symbols.	LAFS.910.W.1.2 LAFS.910.L.1.2	SC.912.P.10.13, 14, 15
	08.02 Set up and use ohmmeters.		SC.912.P.10.13, 14, 15
	08.03 Set up and use a DVA tester or equivalent.		SC.912.P.10.13, 14, 15
	08.04 Set up and use spark testers.		SC.912.P.10.13, 14, 15
	08.05 Set up and use timing lights.		SC.912.P.10.13, 14, 15
	08.06 Set up and use multi-meter.		SC.912.P.10.13, 14, 15
	08.07 Locate and identify parts of capacitor discharge ignition systems.	LAFS.910.W.1.2 LAFS.910.L.1.2	SC.912.P.10.13, 14, 15
	08.08 Locate and match electrical units by their symbols on a wiring diagram.	LAFS.910.RI.2.4 LAFS.910.W.4.10	SC.912.P.10.13, 14, 15
	08.09 Sketch and label complete C/D ignition systems.	LAFS.910.W.1.2; 2.4,5, 6; 3.7, 8, 9; 4.10 LAFS. 910.L.1.2	SC.912.P.10.13, 14, 15
	08.10 Check coil resistance, shorts and grounds with an ohmmeter.		SC.912.P.10.13, 14, 15
	08.11 Check stator windings with an ohmmeter.		SC.912.P.10.13, 14, 15
	08.12 Check sensor coils, charge coils, ignition coils and shorts to ground with a DVA tester or equivalent.		SC.912.P.10.13, 14, 15
	08.13 Check power packs with an ohmmeter and a DVA tester or equivalent.		SC.912.P.10.13, 14, 15
09.0	Maintain and repair outboard fuel systems.-The student will be able to:		
	09.01 Identify the major types of carburetors.	LAFS.910.W.2.4 LAFS.910.SL.2.4, 6	SC.912.P.12.3, 10, 11
	09.02 Check and adjust throttle.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.03 Identify and service different types of EFI/DFI systems.		
09.04 Identify air cleaners.		
09.05 Identify basic carburetor circuits (chokes, floats, fuel inlets; idle, intermediate and high speeds; mains, etc.)		
09.06 Diagnose carburetor problems.		
09.07 Remove, clean, overhaul, replace and make final adjustments to carburetors.		
09.08 Diagnose exhaust problems such as back pressure.		
10.0 Parts specialist and computer skills to industry standards.-The student will be able to:		
10.01 Identify the skills needed to be a service writer.	LAFS.910.W.1.2 LAFS.910.L.1.1, 2	
10.02 Identify the skills needed to be a parts specialist.	LAFS.910.W.1.2 LAFS.910.L.1.1, 2	
10.03 Demonstrate appropriate computer skills.		
10.04 Demonstrate knowledge of different parts and accessories.	LAFS.910.SL.2.4 LAFS.910.W.3.8	

Florida Department of Education
Student Performance Standards

Course Title: **Outboard Marine Service 3**
Course Number: **9504230**
Course Credit: **1**

Course Description:
Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of outboard 4-stroke cycle engines, charging systems, battery ignition systems, and cranking systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.0 Maintain and repair basic four-stroke cycle outboard engines.-The student will be able to:		
11.01 Explain the basic principles of the operation of four-stroke cycle internal combustion engines.	LAFS.1112.SL.2.4 LAFS.1112.W.1.2 LAFS.1112.RI.2.4	SC.912.P.10.1, 5; 12.2, 3
11.02 Identify types of four-stroke cycle engines.	LAFS.1112.SL.2.4	
11.03 Locate engine serial and model numbers.	LAFS.1112.SL.2.4	
11.04 Identify engine assemblies and systems.	LAFS.1112.W.1.2 LAFS.1112.SL.2.4	
11.05 Diagnose valve and head problems by use of the visual inspection method.		
11.06 Diagnose valve and head problems by use of the compression tester method.		SC.912.P.10.1; 12.10, 11
11.07 Disassemble engines and inspect parts.		
11.08 Clean and inspect heads for cracks, warpage and damaged spark plug threads.	MAFS.912.N-Q.1.1, 3	
11.09 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.		
11.10 Adjust valves.	MAFS.912.N-Q.1.3	
11.11 Remove and inspect camshafts and lifters.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.12 Clean and inspect lifters for wear.		
11.13 Time valve drive assemblies.		
11.14 Reassemble engines.		
11.15 Inspect oil seals.	MAFS.912.N-Q.1.3	
11.16 Inspect/replace timing belt/chain.	MAFS.912.N-Q.1.3	
12.0 Maintain and repair outboard charging systems.-The student will be able to:		
12.01 Sketch and label the units of complete charging circuits.	LAFS.1112.W.1.2 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15
12.02 Disassemble charging systems and identify the components.		SC.912.P.10.13, 14, 15
12.03 Perform stator and rectifier testing on charging systems.		SC.912.P.10.13, 14, 15
12.04 Reassemble and test charging systems.		SC.912.P.10.13, 14, 15
12.05 Set up and use ohmmeters.		SC.912.P.10.13, 14, 15
12.06 Reassemble and test complete units.		SC.912.P.10.13, 14, 15
13.0 Maintain and repair outboard battery/EFI ignition systems.-The student will be able to:		
13.01 Locate and identify parts of battery ignition systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2	
13.02 Locate and match electrical units by their symbols on a wiring diagram.	LAFS.1112.RI.2.4 LAFS.1112.W.4.10	SC.912.P.10.13
13.03 Sketch and label complete battery ignition systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2	
13.04 Check coil resistance with an ohmmeter.		SC.912.P.10.13, 14, 15
13.05 Set up and use test equipment.		
13.06 Set timing using timing light.		
13.07 Clean and re-gap spark plugs.		
14.0 Maintain and repair outboard cranking systems.-The student will be able to:		
14.01 Disassemble recoil starters.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.02 Inspect components of recoil starters.		
14.03 Reassemble recoil starters.		
14.04 Identify components of electrical starting systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2;2.4	SC.912.P.10.13, 14, 15
14.05 Bench test switches.		SC.912.P.10.13, 14, 15
14.06 Troubleshoot starting systems using multi-meter.		SC.912.P.10.13, 14, 15
14.07 Locate opens, short and grounds.		SC.912.P.10.13, 14, 15

Florida Department of Education
Student Performance Standards

Course Title: **Outboard Marine Service 4**
Course Number: **9504240**
Course Credit: **1**

Course Description:
Students will learn entry-level skills for the outboard marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of outboard engine lubrication systems, cooling systems, lower gear cases, lower units and housing assemblies, employability, and entrepreneurship.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Maintain and repair outboard lubrication systems.-The student will be able to:		
15.01 Identify the types and functions of lubrication systems.	LAFS.1112.L.1.2 LAFS.1112.W.1.2	
15.02 Explain the principles of lubrication systems.		SC.912.P.10.5
15.03 Identify and locate components of lubrication systems.	LAFS.1112.SL.2.4, 6	
15.04 Check engines for oil leaks.		
15.05 Change engine oil and filters.		
15.06 Check engine oil pressure and level.		
15.07 Recognize and use only recommended oil.		
15.08 Inspect and service oil metering systems.		
16.0 Maintain and repair outboard cooling systems.-The student will be able to:		
16.01 Explain the principles of cooling systems.	LAFS.1112.SL.2.4 LAFS.1112.W.1.2	SC.912.P.10.5, 7, 20
16.02 Trace water flow through cooling systems.		
16.03 Disassemble, examine for problems and reassemble water pumps.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.04	Remove, check and replace thermostats.		SC.912.P.12.3
16.05	Service poppet valves.		
16.06	Service or replace thermostat and thermostat housings.		
17.0	Maintain and repair outboard lower gear cases.-The student will be able to:		
17.01	Remove and replace lower gear cases.		
17.02	Identify the components of lower gear case.	MAFS.912.N-Q.1.1, 3	
17.03	Refill lower gear cases with specified oil.		
17.04	Determine propeller pitch diameter and hub type.	LAFS.1112.L.3.4	SC.912.P.10.6 SC.912.P.12.5, 6
18.0	Assemble and maintain outboard lower units and housing assemblies.-The student will be able to:		
18.01	Disassemble and reassemble steering handle groups.		
18.02	Understand the process for disassembling and assembling exhaust housings and water tube assemblies.		
18.03	Understand the process for replacing motor mounts and shock absorbers.		
18.04	Lubricate all fittings.		
18.05	Pressure and vacuum test gear cases.		SC.912.P.12.10, 11
18.06	Understand the process for removing and servicing cylinders and rams.		SC.912.P.10.2; 12.10
18.07	Adjust the trim and tilt.		
18.08	Determine the differences between mechanical, electrical and hydraulic shifting units.	LAFS.1112.RI.2.4	SC.912.P.10.1; 12.3
18.09	Explain the shifting theory of the lower unit.	LAFS.1112.W.1.2;4.10 LAFS.1112.L.1.1, 2	SC.912.P.10.1; 12.3
18.10	Perform correct procedure for filling trim and tilt with hydraulic oil.		
19.0	Demonstrate employability skills.-The student will be able to:		
19.01	Conduct a job search using periodicals and the internet.		
19.02	Secure information about a job.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.03	Identify documents that may be required when applying for a job interview.		
19.04	Complete a job application form correctly.		
19.05	Demonstrate competence in job interview techniques.		
19.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.		
19.07	Identify acceptable work habits.		
19.08	Demonstrate knowledge of how to make appropriate job changes.		
19.09	Demonstrate acceptable employee health habits.		
19.10	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).		
20.0	Demonstrate an understanding of entrepreneurship.-The student will be able to:		
20.01	Define entrepreneurship.		
20.02	Describe the importance of entrepreneurship to the American economy.		
20.03	List the advantages and disadvantages of business ownership.		
20.04	Identify and explain the risks involved in ownership of a business.		
20.05	Identify and explain the necessary personal characteristics of a successful entrepreneur.		
20.06	Identify and explain the business skills needed to operate a small business efficiently and effectively.		
20.07	Identify and explain the various types of business structures, e.g. sole proprietor, S-Corporation, etc.		

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Marine Technology 1**
Course Number: **9504250**
Course Credit: **1**

Course Description:
Students will learn advanced-level skills for the marine service industry. Hands-on training combined with laboratory and classroom experiences gives the student an understanding of basic four-stroke cycle engines, fuel systems, cooling systems, lubrication systems, ignition systems, and capacitor discharge ignition systems.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.0 Maintain and repair basic four-stroke cycle inboard gas engines.-The student will be able to:		
21.01 Diagnose valve and head problems by use of the visual inspection method.		
21.02 Diagnose valve and head problems by use of the compression tester method.		
21.03 Disassemble engines and inspect parts.		
21.04 Clean and inspect heads for cracks, warpage and damaged spark plug threads.	MAFS.912.N-Q.1.3	
21.05 Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.		
21.06 Adjust valves.		
21.07 Understand the process for removing and inspecting camshafts and lifters.	MAFS.912.N-Q.1.3	
21.08 Understand the process for cleaning and inspecting lifters for wear.		
21.09 Time valve drive assemblies.		
21.10 Understand the process for removing pistons from rod assemblies.		
21.11 Understand the process for measuring out-of-round and cylinder taper with a dial bore gage or micrometer.		
21.12 Understand the process for checking piston pins and bosses for wear.		
22.0 Maintain and repair inboard fuel systems.-The student will be able to:		
22.01 Identify and locate fuel system components (fuel tanks, lines, filters, etc.).		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.02 Sketch and label typical fuel gauge systems.		
22.03 Sketch and label the parts of total fuel systems.		
22.04 Remove and replace fuel gauges.		
22.05 Service fuel lines.		SC.912.P.12.10
22.06 Remove and replace fuel-sending units.		SC.912.P.12.10
23.0 Maintain and repair inboard gas cooling systems.-The student will be able to:		
23.01 Explain the principles of cooling systems, including fresh water cooling systems.		SC.912.P.12.3, 11
23.02 Trace water flow through cooling systems.		SC.912.P.12.10, 11
23.03 Disassemble and reassemble water pumps.		
24.0 Maintain and repair inboard gas lubrication systems.-The student will be able to:		
24.01 Identify the types and functions of lubrication systems.		SC.912.P.12.10, 11
24.02 Explain the principles of lubrication systems.		SC.912.P.12.10, 11
24.03 Identify and locate components of lubrication systems.		SC.912.P.12.10, 11
25.0 Maintain and repair electronic ignition systems.-The student will be able to:		
25.01 Locate and match electrical units by their symbols on a wiring diagram.		SC.912.P.10.13
25.02 Sketch and label complete battery ignition systems.	LAFS.910.W.1.2 LAFS.910.L.1.2 LAFS.1112.W.1.2 LAFS.1112.L.1.2	
26.0 Maintain and repair capacitor discharge ignition systems.-The student will be able to:		
26.01 Sketch and label electrical symbols.	LAFS.910.W.1.2 LAFS.910.L.1.2 LAFS.1112.W.1.2 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15
26.02 Set up and use multi-meters.		SC.912.P.10.13, 14, 15
26.03 Set up and use appropriate test equipment.		SC.912.P.10.13, 14, 15
26.04 Set up and use spark testers.		SC.912.P.10.13, 14, 15; 12.7
26.05 Set up and use timing lights.		SC.912.P.10.13, 14, 15

Florida Department of Education
Student Performance Standards

Course Title: **Advanced Marine Technology 2**
Course Number: **9504260**
Course Credit: **1**

Course Description:
Students will continue to learn advanced-level skills for the marine service industry. Additional hands-on training combined with laboratory and classroom experiences gives the student a full understanding of basic four-stroke cycle engines, fuel systems, cooling systems, lubrication systems, ignition systems, and capacitor discharge ignition systems.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.0 Maintain and repair basic four-stroke cycle inboard gas engines.-The student will be able to:		
21.13 Understand the process for measuring piston ring lands width, out-of-round and taper.	MAFS.912.N-Q.1.3	
21.14 Understand the process for measuring the piston ring gap in cylinder bores.	MAFS.912.N-Q.1.3	
21.15 Understand the process for installing and fitting piston pins.	MAFS.912.N-Q.1.3	
21.16 Understand the process for checking rod and piston assembly alignment.		
21.17 Understand the process for removing and replacing rod bearings.		
21.18 Hone and clean cylinders.	MAFS.912.N-Q.1.3	SC.912.P.12.3
21.19 Install rings on pistons.		
21.20 Measure and check crankshafts with a micrometer.	MAFS.912.N-Q.1.3	
21.21 Check for end play.	MAFS.912.N-Q.1.3	
21.22 Understand the process for checking bearing bores with a telescoping gage.	MAFS.912.N-Q.1.3	
21.23 Reassemble engines.		
21.24 Install oil seals.		
21.25 Inspect/replace timing belt/chain.		
22.0 Maintain and repair inboard fuel systems.-The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.07 Describe or demonstrate the process for removing, cleaning, inspecting and installing fuel tanks.		SC.912.P.8.1
22.08 Vacuum test fuel system.		SC.912.P.12.10
22.09 Remove, replace service and check the pressure of fuel pumps.		
22.10 Remove, clean and replace in-line filters.		
22.11 Identify the major types of carburetors.		
22.12 Check and adjust throttle linkages.		
22.13 Identify and service different types of EFI systems.		
22.14 Identify and understand different types of Vapor Separator Tank (VST) systems.		
22.15 Remove, service, and replace flame arrestors.		
23.0 Maintain and repair inboard gas cooling systems.-The student will be able to:		
23.04 Remove, check and replace thermostats.		
23.05 Check thermostat pressure relief systems.		
23.06 Service manifolds, risers and thermostat housings.		
24.0 Maintain and repair inboard gas lubrication systems.-The student will be able to:		
24.04 Check engines for oil leaks.		
24.05 Change engine oil and filters.		
24.06 Check engine oil pressure and level.		SC.912.P.12.10, 11
24.07 Recognize and use only recommended oil.		SC.912.P.12.10, 11
25.0 Maintain and repair electronic ignition systems.-The student will be able to:		
25.03 Set up and use test equipment.		SC.912.P.10.13, 14, 15
25.04 Set timing using a timing light		
26.0 Maintain and repair capacitor discharge ignition systems.-The student will be able to:		
26.06 Locate and identify parts of capacitor discharge ignition systems.	LAFS.910.W.1.2 LAFS.910.L.1.2	SC.912.P.10.13, 14, 15

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
	LAFS.1112.W1.2 LAFS.1112.L.1.2	
26.07 Locate and match electrical units by their symbols on a wiring diagram.	LAFS.910.RI.2.4, LAFS.910.W.1.2;4.10 LAFS.910.L.1.2 LAFS.1112.RI.2.4 LAFS.1112.W.1.2;4.10 LAFS.1112.L.1.2	SC.912.P.10.13, 14, 15
26.08 Check coil resistance, shorts and grounds with an ohmmeter.		SC.912.P.10.13, 14, 15
26.09 Check sensor coils, charge coils, ignition coils and shorts to ground with appropriate test equipment.		SC.912.P.10.13, 14, 15

Florida Department of Education
Student Performance Standards

Course Title: **Outboard Marine Service Capstone**
Course Number: **9504270**
Course Credit: **1**

Course Description:
This course provides students with extended content and skills essential to the planning, design, creation, and presentation of an outboard marine technology capstone project.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
27.0	Conceive, design, and present a marine project(s) that encompass all the skills learned in the Outboard Marine Service Technology program.-The student will be able to:		
27.01	Create and produce an original working drawing using outboard marine nomenclature.		
27.02	Compose a well written design proposal and present to instructor for approval.		
27.03	Incorporate principles and practices of outboard marine technology into the project.		
28.0	Plan, organize, and carry out a project plan.-The student will be able to:		
28.01	Determine the scope of a project.		
28.02	Organize tasks.		
28.03	Determine project priorities.		
28.04	Identify required resources.		
28.05	Record project progress in a process journal.		
28.06	Record and account for budget expenses during the life of the project.		
28.07	Carry out the project plan to successful completion and delivery.		
29.0	Formulate strategies to properly manage resources.-The student will be able to:		
29.01	Identify required resources and associated costs for each stage of the project plan.		
29.02	Create a project budget based on the identified resources.		
29.03	Determine the methods needed to acquire needed resources.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	29.04 Demonstrate good judgment in the use of resources.		
	29.05 Recycle and reuse resources where appropriate.		
	29.06 Demonstrate an understanding of proper legal and ethical waste disposal.		
30.0	Use tools, materials, and processes in an appropriate and safe manner.-The student will be able to:		
	30.01 Identify and use the proper tool for a given job.		
	30.02 Use tools and machines in a safe manner.		
	30.03 Adhere to laboratory safety rules and procedures.		
	30.04 Identify the application of processes appropriate to the task at hand.		
	30.05 Identify materials appropriate to their application.		
31.0	Create a project portfolio describing the marine project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results.-The student will be able to:		
	31.01 Create a Design Portfolio documenting project timeline, drawings, and specifications.		
	31.02 Create a Bill of Material (BOM) for your project.		
	31.03 Create and deliver a presentation to communicate project results to other teams.		

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

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Marine Service Technologies (T400210) courses:

Marine Rigger - MTE0003 (300 hours)
Outboard Engine Technician - MTE0090 (300 hours)
Inboard Gas Engine Technician - MTE0092 (300 hours)

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)

SkillsUSA is the intercurricular career and technical student organization 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.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Avionics Systems**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9504300
CIP Number	0647060906
Grade Level	9 – 12
Standard Length	5 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA, FL-TSA
SOC Codes (all applicable)	49-2091 – Avionics Technicians

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The purpose of this program is to prepare students for employment as avionics installation and repair technicians.

The course content includes, but is not limited to, troubleshooting, repair and installation of airborne radio communications, radio navigation and radar equipment systems in accordance with regulatory and industry standards. Also included is instruction in basics of AM and FM transmitters and receivers and avionics equipment. Skills preparation for passing licensing/certification tests required by industry forms an integral part of the curriculum. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices.

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

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.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9504310	Avionics Fundamentals 1	AVIONICS @7 7G ELECTRONIC @7 7G	1 credit	49-2091	3	
B	9504320	Avionics Fundamentals 2		1 credit	49-2091	3	
C	9504330	Avionics Fundamentals 3		1 credit	49-2091	3	
D	9504340	Avionics Fundamentals 4		1 credit	49-2091	3	
E	9504350	Avionics Fundamentals Capstone		1 credit	49-2091	3	PA

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9504310	**	**	**	**	**	**	**	**	**	**	**
9504320	**	**	**	**	**	**	**	**	**	**	**
9504330	**	**	**	**	**	**	**	**	**	**	**
9504340	**	**	**	**	**	**	**	**	**	**	**
9504350	**	**	**	**	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504310	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504320	**	**	**	**	**	**	**
9504330	**	**	**	**	**	**	**
9504340	**	**	**	**	**	**	**
9504350	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

National Standards

Programs identified as having Industry or National Standards corresponding to the standards and/or benchmarks for the Avionics Systems program can be found using the following links:

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 Demonstrate proficiency in the fundamentals of aviation maintenance technology.
02.0 Demonstrate skills in technical communications.
03.0 Demonstrate proficiency in basic aircraft wiring and PCB practices.
04.0 Demonstrate proficiency in basic direct current (DC) circuits.
05.0 Demonstrate proficiency in advanced direct current (DC) circuits.
06.0 Demonstrate proficiency in aircraft direct current (DC) power systems.
07.0 Demonstrate proficiency in alternating current (AC) circuits.
08.0 Demonstrate proficiency in advanced alternating current (AC) circuits.
09.0 Demonstrate proficiency in alternating current (AC) circuit components.
10.0 Demonstrate proficiency in aircraft alternating current (AC) power systems.
11.0 Demonstrate proficiency with aircraft drawings.
12.0 Demonstrate proficiency in solid state devices.
13.0 Demonstrate proficiency in analog circuits.
14.0 Demonstrate an understanding of basic avionics corrosion.
15.0 Demonstrate proficiency in aircraft aerodynamic fundamentals.
16.0 Demonstrate proficiency in Unmanned Aerial Systems Foundations.
17.0 Demonstrate knowledge in Unmanned Aerial Vehicle Operations.
18.0 Demonstrate proficiency in digital circuits.
19.0 Demonstrate proficiency in fundamental microprocessors.
20.0 Demonstrate an understanding of workplace safety practices.
21.0 Demonstrate appropriate communication skills.
22.0 Demonstrate employability skills.
23.0 Demonstrate an understanding of entrepreneurship.
24.0 Demonstrate knowledge of basic avionics systems.
25.0 Conceive, design, and present an avionics project(s) that encompass all the skills learned in the Avionics Systems program.
26.0 Plan, organize, and carry out a project plan.
27.0 Formulate strategies to properly manage resources.
28.0 Use tools, materials, and processes in an appropriate and safe manner.
29.0 Create a project portfolio describing the avionics project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results.

Florida Department of Education
Student Performance Standards

Course Title: **Avionics Fundamentals 1**
Course Number: **9504310**
Course Credit: **1**

Course Description:
This course introduces students to the fundamentals of aviation maintenance, technical communication skills, basic aircraft wiring, PCB practices, basic and advanced DC circuits and power systems. It emphasizes troubleshooting techniques and it brings elements that help to develop fine motor skills. This course defines techniques, requirements and expectations for those seeking to enter the job market as employees or small business owners.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate proficiency in the fundamentals of aviation maintenance technology.-The student will be able to:		
01.01	Apply proper Occupational Safety Health Administration (OSHA) safety standards.		
01.02	Research and report on a career field that supports aviation maintenance technology		
01.03	Identify the parts of an aircraft.		
01.04	Describe how avionics systems integrate with aircraft airframe and propulsion systems.		
01.05	Research and describe the certifications associated with the avionics maintenance technician.		
01.06	Research and report on a type of unmanned aerial vehicle (UAV) or unmanned aerial system (UAS).		
02.0	Demonstrate skills in technical communications.-The student will be able to:		
02.01	Draw and interpret electronic schematics		
02.02	Write reports and make oral presentations.		
02.03	Maintain test logs.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	02.04 Write formal reports of laboratory experiences		
	02.05 Read and follow written instructions.		
	02.06 Answer and ask questions coherently and concisely		
	02.07 Read critically by recognizing assumptions and implications and evaluating ideas.		
03.0	Demonstrate proficiency in basic aircraft wiring and PCB practices.-The student will be able to:		
	03.01 Explain the theoretical concepts and safety precautions of soldering.		
	03.02 Use appropriate hand tools to cut, strip, crimp, splice, solder, and stamp/identify wires and cables to industry standards for aircraft installation.		
	03.03 Prepare, use, install, and inspect general purpose connectors.		
	03.04 Research and identify the proper AN-MS connectors for use in aircraft electrical systems.		
	03.05 Identify and use power tools properly.		
	03.06 Demonstrate acceptable PCB soldering techniques.		
	03.07 Demonstrate acceptable de-soldering techniques.		
	03.08 Demonstrate electrostatic discharge (ESD) safety procedures.		
	03.09 Describe the construction of printed circuit boards (PCB's).		
	03.10 Demonstrate proficiency in reworking and repairing aircraft wiring and PCB’s.		
04.0	Demonstrate proficiency in basic direct current (DC) circuits.-The student will be able to:		
	04.01 Solve problems in electronic units utilizing metric prefixes.		
	04.02 Identify sources of electricity.		
	04.03 Define voltage, current, resistance, power and energy.		
	04.04 Apply Ohm's law and power formulas.		
	04.05 Read and interpret color codes and symbols to identify electrical components and values.		
	04.06 Measure properties of a DC circuit using an analog volt-ohm (VOM) meter.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.07	Measure properties of a DC circuit using a digital multi-meter (DMM).		
04.08	Measure properties of a DC circuit using an oscilloscope.		
04.09	Compute conductance and compute and measure resistance of conductors and insulators.		
04.10	Apply Ohm's law to series circuits.		
04.11	Analyze and troubleshoot series circuits.		
04.12	Apply Ohm's law to parallel circuits.		
04.13	Analyze and troubleshoot parallel circuits.		
05.0	Demonstrate proficiency in advanced direct current (DC) circuits.-The student will be able to:		
05.01	Solve algebraic problems to include exponentials to DC.		
05.02	Relate electricity to the nature of matter.		
05.03	Apply Ohm’s law to series-parallel and parallel-series circuits.		
05.04	Verify the operation of series-parallel, parallel-series, and bridge circuits.		
05.05	Troubleshoot series-parallel and parallel-series and bridge circuits.		
05.06	Identify and define voltage divider circuits (loaded and unloaded).		
05.07	Verify the operation of voltage divider circuits (loaded and unloaded).		
05.08	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).		
05.09	Describe magnetic properties of circuits and devices.		
05.10	Determine the physical and electrical characteristics of capacitors and inductors.		
05.11	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants.		
05.12	Adjust and operate power supplies for DC circuits.		
06.0	Demonstrate proficiency in aircraft direct current (DC) power systems.-The student will be able to:		
06.01	Identify the types and construction of aircraft batteries.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.02	Define battery shop safety features and precautions when servicing various types of aircraft batteries.		
06.03	Explain the process of servicing lead-acid and nickel-cadmium batteries.		
06.04	Describe the types of aircraft DC generation systems.		
06.05	Describe the purpose and operation of aircraft DC current limiters, regulators, and reverse current relays.		

Florida Department of Education
Student Performance Standards

Course Title: **Avionics Fundamentals 2**
Course Number: **9504320**
Course Credit: **1**

Course Description:
This course builds on the skills identified in Avionics Fundamentals 1. Students will learn basic and advanced AC circuitry, components, aircraft AC power systems, and aircraft drawings.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Demonstrate proficiency in alternating current (AC) circuits.-The student will be able to:		
07.01	Solve basic trigonometric problem as applicable to electronics.		
07.02	Measure the properties of AC circuits using multi-meters.		
07.03	Measure the properties of an AC circuit using an oscilloscope.		
07.04	Identify the sources of AC electricity.		
07.05	Use a function generator to inject signals into an AC circuits.		
07.06	Define frequency, cycle, Hertz, wavelength, sine wave, phase angle, and period.		
07.07	Calculate peak-to-peak, average, and RMS values of an AC signal.		
07.08	Identify sine waves, square waves, saw-tooth waves, and ramp waveforms.		
07.09	Use Ohm’s law to determine resistance in an AC circuit.		
07.10	Define the characteristics of AC capacitive circuits.		
07.11	Analyze and troubleshoot AC capacitive circuits.		
07.12	Define the characteristics of AC inductive circuits.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	07.13 Analyze and troubleshoot AC inductive circuits.		
08.0	Demonstrate proficiency in advanced alternating current (AC) circuits.-The student will be able to:		
	08.01 Define characteristics of resistive, inductive and capacitive (RLC) circuits (series, parallel and complex).		
	08.02 Define the characteristics of series and parallel resonant circuits.		
	08.03 Analyze and troubleshoot R-C, R-L, and RLC circuits.		
	08.04 Define the characteristics of frequency selective filter circuits.		
	08.05 Analyze and troubleshoot frequency selective filter circuits.		
	08.06 Define the characteristics of poly-phase circuits.		
09.0	Demonstrate proficiency in alternating current (AC) circuit components.-The student will be able to:		
	09.01 Define and apply the principles of transformers to AC circuits.		
	09.02 Calculate transformer primary and secondary voltage, turn ratio, current, and power.		
	09.03 Analyze and troubleshoot step-up, step-down, and auto transformers.		
	09.04 Describe the characteristics and operation of relays and switches.		
	09.05 Analyze and troubleshoot relays and switches.		
	09.06 Define basic AC generator theory and operation.		
	09.07 Define basic AC motor theory and operation.		
	09.08 Adjust and operate power supplies for AC circuits.		
	09.09 Analyze and measure power in AC circuits.		
10.0	Demonstrate proficiency in aircraft alternating current (AC) power systems.-The student will be able to:		
	10.01 Describe the types and operation of aircraft AC generation systems.		
	10.02 Describe the operation of basic aircraft DC and AC power distribution systems.		
	10.03 Describe the operation of aircraft multi-engine power distribution systems.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.0 Demonstrate proficiency with aircraft drawings.-The student will be able to:		
11.01 Identify and define the symbols, lines, and markings on aircraft flowcharts, drawings and diagrams.		
11.02 Read and interpret aircraft drawings and blueprints.		
11.03 Prepare sketches of aircraft repairs and alterations.		
11.04 Use of charts and graphs.		
11.05 Describe the types of CAD systems and demonstrate the basic functions of a CAD program.		

Florida Department of Education
Student Performance Standards

Course Title: **Avionics Fundamentals 3**
Course Number: **9504330**
Course Credit: **1**

Course Description:
This course builds on the knowledge and skills found in Avionics Fundamentals 1 & 2. Students will learn solid state devices, analog circuits, basic avionics corrosion, aircraft aerodynamics, foundations of Unmanned Aerial Systems, and Unmanned Aerial Systems operations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.0 Demonstrate proficiency in solid state devices.-The student will be able to:		
12.01 Identify and define properties of semiconductor materials.		
12.02 Identify and define operating characteristics and applications of junction diodes.		
12.03 Identify and define operating characteristics and applications of special diodes.		
12.04 Analyze and troubleshoot diode circuits.		
12.05 Identify and define operating characteristics and applications of bipolar transistors,		
12.06 Identify and define operating characteristics and applications of field effect transistors.		
12.07 Identify and define operating characteristics and applications of single-stage amplifiers.		
12.08 Analyze and troubleshoot single-stage amplifiers.		
12.09 Analyze and troubleshoot thyristor circuitry.		
12.10 Set up and operate DVM for solid-state devices.		
12.11 Set up and operate power supplies for solid-state devices.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.12 Set up and operate oscilloscopes for solid-state devices.		
12.13 Set up and operate function generators for solid-state devices.		
12.14 Demonstrate transistor testing techniques.		
13.0 Demonstrate proficiency in analog circuits.-The student will be able to:		
13.01 Identify and define operational characteristics and applications of multistage amplifiers.		
13.02 Analyze and troubleshoot multistage amplifiers.		
13.03 Identify and define operating characteristics and applications of linear integrated circuits.		
13.04 Identify and define operating characteristics and applications of basic power supplies and filters.		
13.05 Analyze and troubleshoot differentiator and integrator circuits.		
13.06 Identify and define operating characteristics and applications of differential and operational amplifiers.		
13.07 Analyze and troubleshoot differential and operational amplifier circuits.		
13.08 Identify and define operating characteristics of audio power amplifiers.		
13.09 Analyze and troubleshoot audio power amplifiers.		
13.10 Identify and define operating characteristics and applications of power supply regulator circuits.		
13.11 Analyze and troubleshoot power supply regulator circuits.		
13.12 Identify and define operating characteristics and applications of active filters.		
13.13 Analyze and troubleshoot active filter circuits.		
13.14 Identify and define operating characteristics and applications of sinusoidal and non-sinusoidal oscillator circuits.		
13.15 Analyze and troubleshoot oscillator circuits.		
13.16 Identify and define operating characteristics and applications of cathode ray tubes.		
13.17 Identify and define operating characteristics and applications of optoelectronic devices.		
13.18 Define the operating characteristics of analog-type servo motors.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.19	Use basic electronics test equipment to measure and analyze analog circuits.		
14.0	Demonstrate an understanding of basic avionics corrosion.-The student will be able to:		
14.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
14.02	Describe the types of corrosion and explain their effects on avionics equipment.		
14.03	Describe the preventative processes to reduce or eliminate avionics corrosion.		
15.0	Demonstrate proficiency in aircraft aerodynamic fundamentals.-The student will be able to:		
15.01	Identify and explain the effects of aerodynamic forces on aircraft structures and components		
15.02	Identify and describe the purpose aircraft flight controls and aircraft how they affect flight operations.		
15.03	Define the concept of weight and balance in aircraft to include arms, weights, moments, the Law of Lever, and the center of gravity.		
15.04	Describe the effects of installing equipment, modifying equipment, modifying airframe structures and repositioning equipment on weight and balance.		
16.0	Demonstrate proficiency in Unmanned Aerial Systems Foundations.-The students will be able to:		
16.01	Compare and contrast the differences between UAS and UAV components, elements and systems.		
16.02	Identify UAV structures, fabrication methods, and components.		
16.03	Describe the types of UAV aerodynamics and flight characteristics		
16.04	Define the certifications and requirements required of UAS operators and technicians		
16.05	Explain cost and risk factors associated with and alleviated by the usage of Unmanned Aerial System.		
17.0	Demonstrate knowledge in Unmanned Aerial Vehicle Operations.-The students will able to:		
17.01	Demonstrate an understanding of the levels of direct and autonomous control currently in use for guiding, navigating, and controlling a UAV.		
17.02	Discriminate the various types of UAV payloads, power, and communications systems		
17.03	Understand and apply the regulatory requirements outlined by the FAA (Federal Aviation Administration) in the ownership, use, and operation of an Unmanned Aerial Vehicle.		

Florida Department of Education
Student Performance Standards

Course Title: **Avionics Fundamentals 4**
Course Number: **9504340**
Course Credit: **1**

Course Description:
This course builds on the knowledge and skills found in Avionics Fundamentals 1, 2, & 3. Students will learn digital circuitry, microprocessors, workplace safety skills, communication skills, employability skills, entrepreneurship, and the basics of avionic systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
18.0 Demonstrate proficiency in digital circuits.-The student will be able to:		
18.01 Define and apply numbering systems to codes and arithmetic operations.		
18.02 Analyze and minimize logic circuits using Boolean operations.		
18.03 Set up and operate logic probes for digital circuits.		
18.04 Set up and operate power supplies for digital circuits and solve power distribution and noise problems.		
18.05 Set up and operate pulsers for digital circuits.		
18.06 Set up and operate oscilloscopes for digital circuits.		
18.07 Set up and operate logic analyzers for digital circuits.		
18.08 Set up and operate pulse generators for digital circuits.		
18.09 Identify types of logic gates and their truth tables.		
18.10 Verify combinational logic circuits made up of integrated circuits.		
18.11 Troubleshoot logic circuits.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
18.12 Analyze types of flip-flops and their truth tables.		
18.13 Troubleshoot flip-flops.		
18.14 Identify, define and measure characteristics of integrated circuit (IC) logic families.		
18.15 Identify types of registers and counters.		
18.16 Troubleshoot registers and counters.		
18.17 Analyze clock and timing circuits.		
18.18 Troubleshoot clock and timing circuits.		
18.19 Identify types of arithmetic-logic circuits.		
18.20 Troubleshoot arithmetic-logic circuits.		
18.21 Identify types of encoding and decoding devices.		
18.22 Troubleshoot encoders and decoders.		
18.23 Identify types of multiplexer and de-multiplexer circuits.		
18.24 Troubleshoot multiplexer and de-multiplexer circuits.		
18.25 Identify types of memory circuits.		
18.26 Relate the uses of digital-to-analog and analog-to-digital conversions.		
18.27 Troubleshoot digital-to-analog and analog-to-digital circuits.		
18.28 Identify types of digital displays.		
18.29 Troubleshoot digital display circuits.		
18.30 Demonstrate the operating characteristics of digital-type servo and stepper motors		
19.0 Demonstrate proficiency in fundamental microprocessors.-The student will be able to:		
19.01 Identify central processing unit (CPU) building blocks and their uses (architecture).		
19.02 Analyze bus concepts.		
19.03 Analyze various memory schemes.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.04	Verify memory device operation.		
19.05	Set up and operate oscilloscopes for microprocessor systems.		
19.06	Identify types of input and output devices and peripherals.		
19.07	Interface input and output ports to peripherals.		
19.08	Analyze and troubleshoot input and output ports.		
19.09	Develop a simple microprocessor and/or microcontroller application program.		
20.0	Demonstrate an understanding of workplace safety practices.-The student will be able to:		
20.01	Use Safety Data Sheets (SDS) information to determine the use, safety precautions, and disposition of chemicals used in avionics applications.		
20.02	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
20.03	Describe flight line safety to include foreign object elimination, situational awareness, aircraft movement precautions, fire classifications, and fire extinguishing.		
21.0	Demonstrate appropriate communication skills.-The student will be able to:		
21.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
21.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
21.03	Demonstrate appropriate telephone/communication skills.		
21.04	Make equipment failure reports.		
21.05	Specify and requisition simple electronic components.		
21.06	Compose technical letters and memoranda.		
21.07	Draft preventive maintenance procedures.		
21.08	Use an analysis of technical data to form conclusions and recommend changes.		
22.0	Demonstrate employability skills.-The student will be able to:		
22.01	Discuss elements of job search.		
22.02	Develop sources of information about a job.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.03 Identify documents that may be required when applying for a job.		
22.04 Complete a job application correctly.		
22.05 Demonstrate competence in job interview techniques.		
22.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.		
22.07 Identify acceptable work habits.		
22.08 Demonstrate knowledge of how to make appropriate job changes.		
22.09 Demonstrate acceptable employee health habits.		
22.10 Demonstrate knowledge of the Federal Law as recorded in (29 CFR-1910.1200).		
22.11 Write a proper resume.		
23.0 Demonstrate an understanding of entrepreneurship.-The student will be able to:		
23.01 Define entrepreneurship.		
23.02 Describe the importance of entrepreneurship to the American economy.		
23.03 List the advantages and disadvantages of business ownership.		
23.04 Identify the risks involved in ownership of a business.		
23.05 Identify the necessary personal characteristics of an entrepreneur.		
23.06 Identify the business skills needed to operate a small business efficiently and effectively.		
23.07 Define various corporate structures. (e.g., S-Corp, C-Corp, Sole Proprietor, LLC, and ESOP).		
24.0 Demonstrate knowledge of basic avionics systems.-The student will be able to:		
24.01 Identify and describe aircraft communications systems.		
24.02 Identify and describe aircraft short-range navigation systems.		
24.03 Identify and describe aircraft long-range navigation systems		
24.04 Identify the types of flight instruments and state their purpose.		

Florida Department of Education
Student Performance Standards

Course Title: **Avionics Fundamentals Capstone**
Course Number: **9504350**
Course Credit: **1**

Course Description:
This course provides students with extended content and skills essential to the planning, design, creation, and presentation of an Avionics Systems capstone project.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
25.0	Conceive, design, and present an avionics project(s) that encompass all the skills learned in the Avionics Fundamentals program.-The student will be able to:		
25.01	Create and produce an original working drawing using avionics nomenclature.		
25.02	Compose a well written design proposal and present to instructor for approval.		
25.03	Incorporate principles and practices of Avionics Systems into the project.		
26.0	Plan, organize, and carry out a project plan.-The student will be able to:		
26.01	Determine the scope of a project.		
26.02	Organize tasks.		
26.03	Determine project priorities.		
26.04	Identify required resources.		
26.05	Record project progress in a process journal.		
26.06	Record and account for budget expenses during the life of the project.		
26.07	Carry out the project plan to successful completion and delivery.		
27.0	Formulate strategies to properly manage resources.-The student will be able to:		
27.01	Identify required resources and associated costs for each stage of the project plan.		
27.02	Create a project budget based on the identified resources.		
27.03	Determine the methods needed to acquire needed resources.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	27.04 Demonstrate good judgment in the use of resources.		
	27.05 Recycle and reuse resources where appropriate.		
	27.06 Demonstrate an understanding of proper legal and ethical waste disposal.		
28.0	Use tools, materials, and processes in an appropriate and safe manner.-The student will be able to:		
	28.01 Identify and use the proper tool for a given job.		
	28.02 Use tools and machines in a safe manner.		
	28.03 Adhere to laboratory safety rules and procedures.		
	28.04 Identify the application of processes appropriate to the task at hand.		
	28.05 Identify materials appropriate to their application.		
29.0	Create a project portfolio describing the avionics project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results.-The student will be able to:		
	29.01 Create a Design Portfolio documenting project timeline, drawings, and specifications.		
	29.02 Create a Bill of Material (BOM) for your project.		
	29.03 Create and deliver a presentation to communicate project results to other teams.		

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

The occupational standards and benchmarks of courses 9504310, 9504320, 9504330, & 9504340 outlined in this secondary program correlate to the first 600hrs of the standards and benchmarks for the Avionics Systems Technician (T400310) postsecondary program.

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)

SkillsUSA and Florida Technology Student Association (FL-TSA) are the intercurricular 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.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Diesel Maintenance Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9504400
CIP Number	0647060514
Grade Level	9 – 12
Standard Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9098 – Helpers—Installations, Maintenance, and Repair Workers 49-3031 – Bus and Truck Mechanics and Diesel Engine 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 in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The course content should also include training in communication, leadership, human relations and employability skills; and safe efficient work practices.

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

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

It is highly recommended that the courses be taught in sequential order.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8742010	Diesel Engine Service 1	DIESEL MECH @7 7G	1 credit	49-9098	3	
B	9504410	Diesel Maintenance Technology 1		1 credit	49-3031	2	
C	9504420	Diesel Maintenance Technology 2		1 credit	49-3031	3	
	9504430	Diesel Maintenance Technology 3		1 credit		3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8742010	**	**	**	**	**	**	**	**	**	**	**
9504410	**	**	**	**	**	**	**	**	**	**	**
9504420	**	**	**	**	**	**	**	**	**	**	**
9504430	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8742010	**	**	**	**	**	**	**
9504410	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504420	**	**	**	**	**	**	**
9504430	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Proficiently explain and apply required shop and personal safety tasks.
02.0 Identify the basic diesel components and functions.
03.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment.
04.0 Identify principles, assemblies, and systems of engine operation.
05.0 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
06.0 Demonstrate workplace employability skills related to personal standards and work habits/ethics.
07.0 Diagnose and repair air supply and service systems.
08.0 Diagnose and repair mechanical/foundation air brake systems.
09.0 Diagnose and repair parking brakes.
10.0 Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC).
11.0 Diagnose and repair wheel bearings.
12.0 Diagnose and repair Engine systems.
13.0 Diagnose and repair Fuel system
14.0 Diagnose and repair Air induction and exhaust system
15.0 Diagnose and repair Cooling system
16.0 Diagnose and repair Lubrication system
17.0 Diagnose and repair Instruments and controls
18.0 Diagnose and repair Safety equipment
19.0 Diagnose and repair Hardware
20.0 Diagnose and repair Heating, ventilation, and air conditioning (HVAC)
21.0 Diagnose and repair Battery and starting systems
22.0 Diagnose and repair Electrical/Electronic charging systems
23.0 Diagnose and repair Lighting systems.
24.0 Diagnose and repair Air brake systems.
25.0 Diagnose and repair Hydraulic brake systems.
26.0 Diagnose and repair Drive Train systems.
27.0 Diagnose and repair Suspension and steering systems.
28.0 Diagnose and repair Tires and wheels.
29.0 Diagnose and repair Frame and fifth wheel.

Florida Department of Education
Student Performance Standards

Course Title: **Diesel Engine Service 1**
Course Number: **8742010**
Course Credit: **1**

Course Description:
The Diesel Engine Service 1 course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study shop and personal safety skills, basic diesel components, tools and equipment, occupational safety, engine operation, and workplace employment skills.

For every task in Diesel Engine Service 1, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
ASE = Required Supplemental Tasks

Note: This course is pending alignment in the following categories: FS-M/LA and Priority Number

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
01.0	Proficiently explain and apply required shop and personal safety tasks.- The student will be able to:			
01.01	Identify basic shop organization and management regulations.			
01.02	Identify and apply general and required shop safety rules and procedures.	ASE		
01.03	Utilize safe procedures for handling of tools and equipment.	ASE		
01.04	Identify and use proper placement of floor jacks and jack stands.	ASE		
01.05	Identify and use proper procedures for safe lift operation.	ASE		
01.06	Utilize proper ventilation procedures for working within the lab/shop area.	ASE		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
01.07	Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.	ASE		
01.08	Identify the location and use of eye wash stations.	ASE		
01.09	Identify and comply with the required use of PPE during lab/shop activities.	ASE		
01.10	Secure hair and jewelry for lab/shop activities.	ASE		
01.11	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.	ASE		
01.12	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).	ASE		
01.13	Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE		
01.14	Assist in activities and job tasks, in accordance with local, state, and federal safety and environmental regulations.			
01.15	Identify and comply with personal and environmental safety practices associated with the handling, storage, and disposal of chemicals and hazardous materials.			
02.0	Identify the basic diesel components and functions.-The student will be able to:			
02.01	Identify seals, gaskets, and bearings.			
02.02	Identify drive train components and functions.			
02.03	Identify threaded fasteners by size, type, thread series, thread classes, material hardness, and compatibility			
03.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment.-The student will be able to:			
03.01	Identify tools and demonstrate their proper usage.	ASE		
03.02	Identify standard and metric designation.	ASE		
03.03	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE		
03.04	Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper, etc.).	ASE		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
04.0	Identify principles, assemblies, and systems of engine operation.-The student will be able to:			
04.01	Explain the basic principles in the operation of the four-stroke-cycle diesel engine			
04.02	Identify engine assemblies and systems.			
04.03	Identify the components of and explain the operating principles of two and four-stroke cycle engines.			
04.04	Identify governor types and their operating principles.			
05.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.-The student will be able to:			
05.01	Identify information needed and the service requested on a repair order.	ASE		
05.02	Identify purpose and demonstrate proper use of fender covers, mats.	ASE		
05.03	Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE		
05.04	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE		
05.05	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)	ASE		
06.0	Demonstrate workplace employability skills related to personal standards and work habits/ethics.-The student will be able to:			
06.01	Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.	ASE		
06.02	Dresses appropriately and uses language and manners suitable for the workplace.	ASE		
06.03	Maintains appropriate personal hygiene.	ASE		
06.04	Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.	ASE		
06.05	Demonstrates honesty, integrity and reliability.	ASE		
06.06	Complies with workplace policies/laws	ASE		
06.07	Contributes to the success of the team, assists others and requests help when needed.	ASE		
06.08	Works well with all customers and coworkers.	ASE		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.09 Negotiates solutions to interpersonal and workplace conflicts.	ASE		
06.10 Contributes ideas and initiative.	ASE		
06.11 Follows directions.	ASE		
06.12 Communicates (written and verbal) effectively with customers and coworkers.	ASE		
06.13 Reads and interprets workplace documents; writes clearly and concisely.	ASE		
06.14 Analyzes and resolves problems that arise in completing assigned tasks.	ASE		
06.15 Organizes and implements a productive plan of work.	ASE		
06.16 Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.	ASE		
06.17 Identifies and address the needs of all customers, providing helpful, courteous and knowledgeable service and advice as needed.	ASE		

Florida Department of Education
Student Performance Standards

Course Title: **Diesel Maintenance Technology 1**
Course Number: **9504410**
Course Credit: **1**

Course Description:
The Diesel Maintenance Technology 1 course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study diagnostic, service, and repair of air brakes.

For every task in Diesel Maintenance Technology 1 the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
BR – Brakes

Note: This course is pending alignment in the following categories: FS-M/LA

BR Task List:
P-1 = 33
P-2 = 5
P-3 = 3
Total 41

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
07.0	Diagnose and repair air supply and service systems.-The student will be able to:			
07.01	Identify and diagnose poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action.	P-1		
07.02	Check air system build-up time; determine needed action.	P-1		
07.03	Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.	P-1		
07.04	Inspect air compressor drive gear, belts and coupling; adjust or replace as needed.	P-3		
07.05	Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.	P-1		
07.06	Inspect and test air system pressure controls: governor,	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
	unloader assembly valves, filters, lines, hoses, and fittings; replace as needed.			
07.07	Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.	P-1		
07.08	Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves, and manual/automatic drain valves; replace as needed.	P-1		
07.09	Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.	P-1		
07.10	Inspect and test brake application (foot/treadle) valve, fittings, and mounts; check pedal operation; replace as needed.	P-1		
07.11	Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.	P-1		
07.12	Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.	P-1		
07.13	Inspect and test brake relay valve; replace as needed.	P-1		
07.14	Inspect and test quick release valves; replace as needed.	P-1		
07.15	Inspect and test tractor protection valve; replace as needed.	P-1		
07.16	Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (as applicable)	P-1		
07.17	Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.	P-1		
07.18	Inspect and test air pressure gauges, lines, and fittings; replace as needed.	P-2		
08.0	Diagnose and repair mechanical/foundation air brake systems.-The student will be able to:			
08.01	Identify and diagnose poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action.	P-1		
08.02	Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.	P-1		
08.03	Identify type, inspect and service slack adjusters; perform needed action.	P-1		
08.04	Inspect camshafts, tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs;	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
	replace as needed.			
08.05	Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.	P-2		
08.06	Inspect and measure brake shoes or pads; perform needed action.	P-1		
08.07	Inspect and measure brake drums or rotors; perform needed action.	P-1		
09.0	Diagnose and repair parking brakes.-The student will be able to**:**			
09.01	Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.	P-1		
09.02	Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.	P-1		
09.03	Inspect and test parking (spring) brake application and release valve; replace as needed.	P-1		
09.04	Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.	P-1		
09.05	Identify and test anti compounding brake function.	P-1		
10.0	Diagnose and repair air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC).-The student will be able to:			
10.01	Observe antilock brake system (ABS) warning light operation (includes trailer and dash mounted ABS warning light); determine needed action.	P-1		
10.02	Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or electronic service tool(s); determine needed action.	P-1		
10.03	Identify poor stopping and wheel lock-up caused by failure of the antilock brake system (ABS); determine needed action.	P-1		
10.04	Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.	P-1		
10.05	Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.	P-1		
10.06	Bleed the ABS hydraulic circuits according to manufacturers' procedures.	P-2		
10.07	Observe automatic traction control (ATC) warning light operation; determine needed action.	P-3		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
10.08 Diagnose automatic traction control (ATC) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.	P-3		
10.09 Verify power line carrier (PLC) operations.	P-2		
10.10 Diagnose, service, and adjust antilock brake system (ABS) wheel speed sensors and circuits following manufacturers' recommended procedures (including voltage output, resistance, shorts to voltage/ground, and frequency data).			
11.0 Diagnose and repair wheel bearings.-The student will be able to:			
11.01 Clean, inspect, lubricate and replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings. Verify end play with dial indicator method.	P-1		
11.02 Identify, inspect or replace unitized/preset hub bearing assemblies.	P-2		

Florida Department of Education
Student Performance Standards

Course Title: **Diesel Maintenance Technology 2**
Course Number: **9504420**
Course Credit: **1**

Course Description:
The Diesel Maintenance Technology 2 course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine, fuel, air induction and exhaust, lubrication, instruments and control, safety equipment, hardware, heating, ventilation, and air conditioning systems.

For every task in Diesel Maintenance Technology 2, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The tasks included in the Diesel Maintenance Technology 2 area are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning environment. They are not intended to satisfy the Annual Federal Vehicle Inspection requirement as prescribed in the Federal Motor Carrier Safety Regulations, Part 396, Appendix G to Subchapter B, Minimum Periodic Inspection Standards.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
PM = Preventative Maintenance

PM Task List:	
P-1 =	**49**
P-2 =	**7**
P-3 =	**0**
Total	**56**

Note: This course is pending alignment in the following categories: FS-M/LA

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
12.0 Diagnose and repair Engine systems.-The student will be able to:			
12.01 Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.	P-1		
12.02 Inspect vibration damper.	P-1		
12.03 Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.	P-1		
12.04 Check engine oil level and condition; check dipstick seal.	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
12.05	Inspect engine mounts for looseness and deterioration.	P-1		
12.06	Check engine for oil, coolant, air, fuel and exhaust leaks (Engine Off and Running).	P-1		
12.07	Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.	P-1		
12.08	Check electrical wiring, routing, and hold-down clamps, including Engine Control Module/Powertrain Control Module (ECM/PCM).			
13.0	Diagnose and repair Fuel system.-The student will be able to:			
13.01	Check fuel tanks, mountings, lines, caps, and vents.	P-1		
13.02	Drain water from fuel system.	P-1		
13.03	Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.	P-1		
14.0	Diagnose and repair Air induction and exhaust system.-The student will be able to:			
14.01	Check exhaust system mountings for looseness and damage.	P-1		
14.02	Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and after treatment devices, if equipped.	P-1		
14.03	Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.	P-1		
14.04	Inspect turbocharger for leaks; check mountings and connections.	P-1		
14.05	Check operation of engine compression/exhaust brake.	P-2		
14.06	Service or replace air filter as needed; check and reset air filter restriction indicator.	P-1		
14.07	Inspect and service crankcase ventilation system.	P-1		
14.08	Inspect diesel exhaust fluid (DEF) system, to include tanks, lines, gauge pump, and filter (if equipped).	P-1		
14.09	Inspect selective catalyst reduction (SCR) system; including diesel exhaust fluid (DEF) for proper levels, leaks, mounting and connections (if equipped).	P-2		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
15.0 Diagnose and repair Cooling system.-The student will be able to:			
15.01 Check operation of fan clutch.	P-1		
15.02 Inspect radiator (including air flow restriction, leaks, and damage) and mountings.	P-1		
15.03 Inspect fan assembly and shroud.	P-1		
15.04 Pressure test cooling system and radiator cap.	P-1		
15.05 Inspect coolant hoses and clamps.	P-1		
15.06 Inspect coolant recovery system.	P-1		
15.07 Check coolant for contamination, additive package concentration, aeration, and protection level (freeze point).	P-1		
15.08 Service coolant filter (if equipped).	P-1		
15.09 Inspect water pump.	P-1		
16.0 Diagnose and repair Lubrication system.-The student will be able to:			
16.01 Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.	P-1		
16.02 Take an engine oil sample for analysis.	P-1		
17.0 Diagnose and repair Instruments and control systems.-The student will be able to:			
17.01 Inspect key condition and operation of ignition switch.	P-1		
17.02 Check warning indicators.	P-1		
17.03 Check instruments; record oil pressure and system voltage.	P-1		
17.04 Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable)	P-2		
17.05 Check HVAC controls.	P-1		
17.06 Check operation of all accessories.	P-1		
17.07 Using electronic service tool(s) or on-board diagnostic system; retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, ABS, and other systems).	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
17.08	Check mechanical and electronic engine speed controls (if equipped).			
18.0	Diagnose and repair Safety equipment.-The student will be able to:			
18.01	Check operation of electric/air horns and back-up warning devices.	P-1		
18.02	Check condition of spare fuses, safety triangles, fire extinguisher, and all required decals.	P-1		
18.03	Inspect seat belts and sleeper restraints.	P-1		
18.04	Inspect wiper blades and arms.	P-1		
19.0	Diagnose and repair Hardware.-The student will be able to:			
19.01	Check operation of wiper and washer.	P-1		
19.02	Inspect windshield glass for cracks or discoloration; check sun visor.	P-1		
19.03	Check seat condition, operation, and mounting.	P-1		
19.04	Check door glass and window operation.	P-1		
19.05	Inspect steps, catwalks, and grab handles (if applicable).	P-1		
19.06	Inspect mirrors, mountings, brackets, and glass.	P-1		
19.07	Record all observed physical damage.	P-2		
19.08	Lubricate all cab and hood grease fittings.	P-2		
19.09	Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.	P-1		
19.10	Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.	P-1		
19.11	Inspect tilt cab hydraulic pump, lines, and cylinders for leakage; inspect safety devices; service as needed.			
20.0	Diagnose and repair Heating, ventilation, and air conditioning (HVAC).-The student will be able to:			
20.01	Inspect A/C condenser and lines for condition and visible leaks; check mountings.	P-2		
20.02	Inspect A/C compressor and lines for condition and visible leaks; check mountings.	P-2		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
20.03 Check A/C system condition and operation; check A/C monitoring system, if applicable.	P-1		
20.04 Check HVAC air inlet filters and ducts; service as needed.	P-1		

Florida Department of Education
Student Performance Standards

Course Title: **Diesel Maintenance Technology 3**
Course Number: **9504430**
Course Credit: **1**

Course Description:
The Diesel Maintenance Technology 3 course prepares students for entry into the Diesel Engine Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study electrical/electronic; battery and starting systems, charging systems, and lighting systems; air brakes, hydraulic brakes, drive train, suspension and steering, tires and wheels, frame and fifth wheel systems.

For every task in Diesel Maintenance Technology 3, the following safety task must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations.

The tasks included in the Diesel Maintenance Technology 3 area are entry-level technician inspection tasks designed to introduce the student to correct procedures and practices of vehicle inspection in a teaching/learning environment. They are not intended to satisfy the Annual Federal Vehicle Inspection requirement as prescribed in the Federal Motor Carrier Safety Regulations, Part 396, Appendix G to Subchapter B, Minimum Periodic Inspection Standards.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
PM = Preventative Maintenance

PM Task List:
P-1 = 83
P-2 = 4
P-3 = 0
Total 87

Note: This course is pending alignment in the following categories: FS-M/LA

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
21.0	Diagnose and repair Electrical/Electronic battery and starting systems.- The student will be able to:			
21.01	Inspect battery box(s), cover(s), and mountings.	P-1		
21.02	Inspect battery hold-downs, connections, cables, and cable routing; service as needed.	P-1		
21.03	Check/record battery state-of-charge (open circuit voltage) and condition.	P-1		
21.04	Perform battery test (load and/or capacitance).	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
21.05	Inspect starter, mounting, and connections.	P-1		
21.06	Engage starter; check for unusual noises, starter drag, and starting difficulty.	P-1		
22.0	Diagnose and repair Electrical/Electronic charging systems.-The student will be able to:			
22.01	Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action.	P-1		
22.02	Perform alternator output tests.	P-1		
23.0	Diagnose and repair Electrical/Electronic lighting systems.-The student will be able to:			
23.01	Check operation of interior lights; determine needed action.	P-1		
23.02	Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.	P-1		
23.03	Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.	P-1		
24.0	Diagnose and repair Air brake systems.-The student will be able to:			
24.01	Check operation of parking brake.	P-1		
24.02	Record air governor cut-in and cut-out setting (psi).	P-1		
24.03	Check operation of air reservoir/tank drain valves.	P-1		
24.04	Check air system for leaks (brakes released).	P-1		
24.05	Check air system for leaks (brakes applied).	P-1		
24.06	Test one-way and double-check valves.	P-1		
24.07	Check low air pressure warning devices.	P-1		
24.08	Check emergency (spring) brake control/modulator valve, if applicable.	P-1		
24.09	Check tractor protection valve.	P-1		
24.10	Test air pressure build-up time.	P-1		
24.11	Inspect coupling air lines, holders, and glad-hands.	P-1		
24.12	Check brake chambers and air lines for secure mounting and damage.	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
24.13	Check operation of air drier.	P-1		
24.14	Inspect and record brake shoe/pad condition, thickness, and contamination.	P-1		
24.15	Inspect and record condition of brake drums/rotors.	P-1		
24.16	Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing	P-1		
24.17	Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.	P-1		
24.18	Lubricate all brake component grease fittings.	P-1		
24.19	Check condition and operation of hand brake (trailer) control valve, if applicable.	P-2		
24.20	Perform antilock brake system (ABS) operational system self-test.	P-1		
24.21	Drain air tanks and check for contamination.	P-1		
24.22	Check condition of pressure relief (safety) valves.	P-1		
25.0	Diagnose and repair Hydraulic brake systems.-The student will be able to:			
25.01	Check master cylinder fluid level and condition.	P-1		
25.02	Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.	P-1		
25.03	Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.	P-1		
25.04	Check operation of hydraulic system: pedal travel, pedal effort, pedal feel.	P-1		
25.05	Inspect calipers for leakage, binding and damage.	P-1		
25.06	Inspect brake assist system (booster), hoses and control valves; check for leaks.	P-1		
25.07	Inspect and record brake lining/pad condition, thickness, and contamination.	P-1		
25.08	Inspect and record condition of brake rotors.	P-1		
25.09	Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.	P-1		
25.10	Check drum brakes for proper adjustment.			

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
26.0	Diagnose and repair Drive Train systems.-The student will be able to:			
26.01	Check operation of clutch, clutch brake, and gearshift.	P-1		
26.02	Check clutch linkage/cable for looseness or binding, if applicable.	P-1		
26.03	Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.	P-1		
26.04	Check clutch adjustment; adjust as needed.	P-1		
26.05	Check transmission case, seals, filter, hoses, lines and cooler for cracks and leaks.	P-1		
26.06	Inspect transmission breather.	P-1		
26.07	Inspect transmission mounts.	P-1		
26.08	Check transmission oil level, condition, determine proper type and service as needed.	P-1		
26.09	Inspect U-joints, yokes, drive-shafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.	P-1		
26.10	Inspect axle housing(s) for cracks and leaks.	P-1		
26.11	Inspect axle breather(s).	P-1		
26.12	Lubricate all drivetrain grease fittings.	P-1		
26.13	Check drive axle(s) oil level, condition, determine proper type, and service as needed.	P-1		
26.14	Change drive axle(s) oil and filter/screen, if applicable; check and clean magnetic plugs.	P-2		
26.15	Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.	P-1		
26.16	Change transmission oil and filter, if applicable; check and clean magnetic plugs.	P-2		
26.17	Check inter-axle differential lock operation.	P-1		
26.18	Check transmission range shift operation.	P-1		
27.0	Diagnose and repair Suspension and steering systems.-The student will be able to:			
27.01	Check steering wheel operation for free play and binding.	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
27.02	Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.	P-1		
27.03	Change power steering fluid and filter.	P-1		
27.04	Inspect steering gear for leaks and secure mounting.	P-1		
27.05	Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.	P-1		
27.06	Check kingpins for wear.	P-1		
27.07	Check wheel bearings for looseness and noise; adjust as necessary.	P-1		
27.08	Check oil level and condition in all non-drive hubs; check for leaks.	P-1		
27.09	Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.	P-1		
27.10	Inspect shock absorbers for leaks and secure mounting.	P-1		
27.11	Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.	P-1		
27.12	Check and record suspension ride height.	P-1		
27.13	Lubricate all suspension and steering grease fittings.	P-1		
27.14	Check axle locating components (radius, torque, and/or track rods).	P-1		
28.0	Diagnose and repair Tires and wheels.-The student will be able to:			
28.01	Inspect tires for wear patterns and proper mounting.	P-1		
28.02	Inspect tires for cuts, cracks, bulges, and sidewall damage.	P-1		
28.03	Inspect valve caps and stems; determine needed action.	P-1		
28.04	Measure and record tread depth; probe for imbedded debris.	P-1		
28.05	Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.	P-1		
28.06	Check wheel mounting hardware condition; determine needed action.	P-1		
28.07	Inspect wheel/rims for proper application, load range and design; ensure dual rims are properly clocked to access valve stems; determine needed action.	P-1		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
28.08	Check tire matching (diameter and tread) on single and dual tire applications.	P-1		
28.09	Re-torque lugs in accordance with manufacturer's specifications.			
29.0	Diagnose and repair Frame and fifth wheel.-The student will be able to:			
29.01	Inspect fifth wheel mounting, bolts, air lines, and locks.	P-1		
29.02	Test operation of fifth wheel locking device; adjust if necessary.	P-1		
29.03	Check quarter fenders, mud flaps, and brackets.	P-1		
29.04	Check pintle hook assembly and mounting; if applicable.	P-2		
29.05	Lubricate all fifth wheel grease fittings and plate; if applicable	P-1		
29.06	Inspect frame and frame members for cracks and damage.	P-1		

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

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the Diesel Maintenance Technician postsecondary program (T440400).

The safety guidelines in the student performance standards have been recommended in the ASE Program Certification Standards for Medium/Heavy Truck Technician Training Program administered by National Automotive Technicians Education Foundation (NATEF).

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)

SkillsUSA is the intercurricular career and technical student organization 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Power Equipment Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9504500
CIP Number	0647060605
Grade Level	9 - 12
Standard Length	6 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3053 – Outdoor Power Equipment and Other Small Engine Mechanics

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The purpose of this program is to prepare students for employment or advanced training in the power and equipment technology industry and for a career as a small gas engine mechanic.

The content includes but is not limited to all aspects of the gasoline engine services technology industry, and demonstrates such elements of the industry as planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
	9504510	Power and Equipment Technology 1	GASENG RPR @7 7G	1 credit	49-3053	3	
A	9504520	Power and Equipment Technology 2		1 credit	49-3053	3	
	9504530	Power and Equipment Technology 3		1 credit	49-3053	3	
B	9504540	Power and Equipment Technology 4		1 credit	49-3053	3	
	9504550	Power and Equipment Technology 5		1 credit	49-3053	3	
C	9504560	Power and Equipment Technology 6		1 credit	49-3053	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9504510	**	**	**	**	**	**	**	**	**	**	**
9504520	**	**	**	**	**	**	**	**	**	**	**
9504530	**	**	**	**	**	**	**	**	**	**	**
9504540	**	**	**	**	**	**	**	**	**	**	**
9504550	**	**	**	**	**	**	**	**	**	**	**
9504560	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504510	**	**	**	**	**	**	**

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9504520	**	**	**	**	**	**	**
9504530	**	**	**	**	**	**	**
9504540	**	**	**	**	**	**	**
9504550	**	**	**	**	**	**	**
9504560	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate an understanding of workplace safety and workplace organization.
02.0 Demonstrate proficiency in performing pre-delivery maintenance services and set-up procedures
03.0 Demonstrate industry-related math skills
04.0 Demonstrate industry-related science skills
05.0 Demonstrate industry-related communication skills.
06.0 Demonstrate proficiency in parts inventory identification and repair order processing.
07.0 Perform basic fuel and exhaust system service.
08.0 Perform basic engine service and minor repairs.
09.0 Perform basic tune-up service.
10.0 Perform power transfer system service and engine controls adjustments.
11.0 Service and repair lubrication systems.
12.0 Diagnose, service, repair and adjust electrical systems
13.0 Service and repair cooling and exhaust systems.
14.0 Service and repair starting systems.
15.0 Diagnose and repair ignition systems.
16.0 Service, repair and adjust engine controls.
17.0 Understand basic two-stroke and four-stroke engines.
18.0 Demonstrate proficiency in repairing and maintaining two-stroke cycle engines.
19.0 Demonstrate proficiency in repairing and maintaining four-stroke cycle engines.
20.0 Demonstrate proficiency in repairing engine interior components.
21.0 Demonstrate proficiency in diagnosing and repairing power transfer systems.
22.0 Demonstrate proficiency in servicing, repairing, and adjusting various types of industry-related power and equipment
23.0 Demonstrate employability skills.
24.0 Demonstrate proficiency in acceptable employee behavior.
25.0 Demonstrate an understanding of entrepreneurship.
26.0 Diagnose, service, repair and adjust portable generators.
27.0 Demonstrate and identify basic principles of electronic fuel management (EFI) systems.

Florida Department of Education
Student Performance Standards

Course Title: **Power and Equipment Technology 1**
Course Number: **9504510**
Course Credit: **1**

Course Description:
The Power and Equipment Technology 1 course prepares students for entry into Power and Equipment Technology 2. Students learn entry-level skills for entry into the outdoor power equipment and other small engine mechanical industries. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of workplace safety and organization; pre-service maintenance and set-up procedures; industry related math, science, and communication skills; part inventory identification; basic fuel and exhaust systems; basic engine service; and basic tune-up.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate an understanding of workplace safety and workplace organization.-The student will be able to:		
01.01	Identify federal and state standards for health and safety, including the “Right-to-Know” law, as recorded in (29 CFR-1910.1200).		
01.02	Identify, demonstrate, apply, and provide evidence of understanding shop safety requirements, organization and management on an ongoing basis.		
01.03	Identify safety requirements for manual, electrical-powered, and pneumatic tools.		
01.04	Demonstrate, apply, and provide evidence of safely using manual, electrical-powered, and pneumatic tools.		
01.05	Identify safety requirements for operation of automated machines and equipment.		
01.06	Demonstrate, apply, and provide evidence of safely operating automated machines and equipment.		
01.07	Identify the safe use of fuels, chemicals, and compounds		
01.08	Demonstrate, apply, and provide evidence of safely using fuels, chemicals, and compounds.		
01.09	Identify and apply electrical-safety procedures.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.10	Identify the safe use of electrical connectors and cords.		
01.11	Demonstrate, apply, and provide evidence of safely using electrical connectors and cords.		
01.12	Identify and apply fire-safety precautions.		
01.13	Research and identify class A, B, and C type fires.		
01.14	Demonstrate and apply the proper procedures for extinguishing class A, B, and C type fires.		
01.15	Identify various workplace injuries.		
01.16	Demonstrate and practice knowledge of first aid and first response procedures appropriate for this course.		
01.17	Identify and apply safety procedures in case of smoke or chemical inhalation.		
01.18	Demonstrate and apply material handling techniques to safely move materials.		
01.19	Demonstrate and apply proper techniques for lifting loads.		
01.20	Research and identify Occupational Safety Health Administration (OSHA) safety standards.		
01.21	Demonstrate, apply, and provide evidence of understanding Occupational Safety Health Administration (OSHA) safety standards.		
01.22	Locate Safety Data Sheets (SDS).		
01.23	Demonstrate understanding and knowledge of using and applying the information located on Safety Data Sheets (SDS).		
01.24	Proactively respond to a safety concern and then document occurrences.		
01.25	Identify and report unsafe conditions.		
01.26	Determine the appropriate corrective action after an unsafe condition is identified.		
01.27	Demonstrate knowledge of various emergency alarms and procedures.		
01.28	Demonstrate knowledge and apply clean-up procedures for spills.		
01.29	Identify and apply procedures for handling hazardous material.		
01.30	Perform safety and environmental inspections.		
01.31	Perform leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.32	Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations.		
01.33	Demonstrate and apply proper equipment shutdown procedures.		
01.34	Identify, select, and use personal protective equipment (PPE).		
01.35	Identify, demonstrate, and apply ergonomic work techniques.		
01.36	Train other students to use and apply safety skills outlined in this standard.		
02.0	Demonstrate proficiency in performing pre-delivery maintenance services and set-up procedures.-The student will be able to:		
02.01	Locate, identify, and interpret manufacturer's identification number information.		
02.02	Inspect tires; determine necessary action.		
02.03	Identify and describe typical gasoline engine lubricants and lubricant properties.		
02.04	Check for proper fluid levels; determine necessary action.		
02.05	Check radiator coolant level (if applicable); determine necessary action.		
02.06	Check filters; determine necessary action.		
02.07	Check accessory circuits; determine necessary action.		
02.08	Test and inspect battery; determine necessary action.		
02.09	Perform battery state-of-charge test; perform slow/fast battery charge.		
02.10	Inspect battery cables, connectors, clamps and hold-downs; determine necessary action.		
02.11	Inspect and test fuses; replace as needed.		
02.12	Detail engine and prepare unit for delivery.		
02.13	Install cables, hoses and electrical assemblies.		
02.14	Inspect cables, connectors, clamps and hold-downs; adjust as necessary.		
02.15	Check drive-chain tension; determine necessary action		
03.0	Demonstrate industry-related math skills.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
03.01	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.		
03.02	Perform metric to SAE (and SAE to metric) conversions.		
03.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
03.04	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
04.0	Demonstrate industry-related science skills.-The student will be able to:		
04.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
04.02	Draw conclusions or make inferences from data.		
04.03	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials and know the proper precautions required for handling such materials.		
04.04	Understand pressure measurement in terms of Pounds per Square Inch (PSI).		
05.0	Demonstrate industry-related communication skills.-The student will be able to:		
05.01	Draw and interpret hydraulic and mechanical schematics.		
05.02	Correctly write reports.		
05.03	Accurately maintain test logs.		
05.04	Create equipment failure reports.		
05.05	Specify and requisition components.		
05.06	Compose technical letters.		
05.07	Write formal reports of laboratory experiences.		
06.0	Demonstrate proficiency in parts inventory identification and repair order processing.-The student will be able to:		
06.01	Read and interpret information in parts and service manuals and other technical media.		
06.02	Perform basic parts inventory tracking.		
06.03	Identify and locate parts to service equipment.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
06.04	Write logical and understandable statements, or phrases, to accurately fill out forms, invoices, and work orders.		
06.05	Prepare cost estimates for jobs using service- and flat-rate standards.		
06.06	Interpret and verify customer concerns; determine needed repairs.		
06.07	Answer and ask questions coherently, concisely, and professionally.		
06.08	Read and follow written and oral instructions.		
07.0	Perform basic fuel and exhaust system service.-The student will be able to:		
07.01	Service air filters; determine necessary action.		
07.02	Inspect exhaust system, mufflers, and heat shields; determine necessary action.		
07.03	Service fuel filters; determine necessary action.		
07.04	Inspect fuel tank and fuel cap; inspect fuel lines, fittings, and hoses; determine necessary action.		
07.05	Determine and use correct fuel and fuel mixtures.		
07.06	Check fuel for contaminants and quality; determine necessary action.		
08.0	Perform basic engine service and minor repairs.-The student will be able to:		
08.01	Identify and demonstrate knowledge of types of engines.		
08.02	Identify and demonstrate knowledge of engine assemblies and systems.		
08.03	Service crankcase breathers.		
08.04	Identify types and ratios of two-cycle mix oils and their application to specific types of equipment.		
08.05	Remove and inspect spark plug(s); determine necessary action.		
08.06	Inspect and test fusible links and fuses; replace as needed.		
09.0	Perform basic tune-up service.-The student will be able to:		
09.01	Drain and refill oil, if applicable.		
09.02	Remove and replace spark plug(s).		
09.03	Service filters and breathers.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.04 Adjust ignition systems timing.		
09.05 Inspect and service power transfer system.		
09.06 Adjust valves.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Equipment Technology 2**
Course Number: **9504520**
Course Credit: **1**

Course Description:
The Power and Equipment Technology 2 course prepares students for entry into Power and Equipment Technology 3. Students will learn entry-level skills for entry into the outdoor power equipment and other small engine mechanical industries. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of transfer systems and engine controls; lubrication; electrical systems; cooling and exhaust systems; starting and ignition systems; and basic two-stroke and four-stroke engines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.0	Perform power transfer system service and engine controls adjustments.-The student will be able to:		
10.01	Inspect and measure drive belts and chains; determine necessary action.		
10.02	Install drive belts and chains.		
10.03	Identify power transfer system components.		
10.04	Replace drive components.		
10.05	Remove, repair, and reinstall clutches.		
10.06	Sharpen and balance blades.		
10.07	Remove and replace or install blades correctly.		
11.0	Service and repair lubrication systems.-The student will be able to:		
11.01	Service seals and gaskets; determine necessary action.		
11.02	Identify lubrication systems.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.03 Service and repair lubrication systems.		
12.0 Diagnose, service, repair and adjust electrical systems.-The student will be able to:		
12.01 Understand and demonstrate knowledge of basic electricity and electronics.		
12.02 Identify basic electricity and electronic symbols.		
12.03 Read, interpret, and identify circuit components using a schematic.		
12.04 Draw and interpret electrical/electronic schematics.		
12.05 Identify and demonstrate knowledge of a basic series, parallel, and combination circuits.		
12.06 Set up and properly use analog or digital multi-meters, voltmeters, ammeters, and ohmmeters.		
12.07 Identify ignition systems and components.		
12.08 Replace electrical system components.		
12.09 Identify and test batteries.		
12.10 Service batteries according to manufacturer's specifications.		
12.11 Service, repair and adjust charging systems.		
12.12 Use proper troubleshooting techniques to measure, identify, and diagnose electrical problems.		
12.13 Use wiring diagrams during diagnosis of electrical circuit problems.		
12.14 Identify damaged wire and electrical harnesses; determine necessary action.		
12.15 Locate opens, shorts, grounds, and resistance problems; determine necessary action.		
13.0 Service and repair cooling and exhaust systems.-The student will		
13.01 Service air cooling fins and screens.		
13.02 Service two-cycle exhaust systems.		
13.03 Service four-cycle exhaust systems.		
14.0 Service and repair starting systems.-The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.01 Service and repair manual starting systems.		
14.02 Service and repair electrical starting systems.		
14.03 Test and service battery starting systems.		
15.0 Diagnose and repair ignition systems.-The student will be able to:		
15.01 Identify and diagnose ignition systems and components.		
15.02 Diagnose and repair magneto ignition systems.		
15.03 Diagnose and repair solid-state ignition systems.		
15.04 Diagnose and repair battery ignition systems.		
15.05 Diagnose and repair impulse ignition systems.		
15.06 Diagnose and repair electronically controlled fuel injection systems.		
16.0 Service, repair and adjust engine controls.-The student will be able to:		
16.01 Service, repair and adjust governor speed controls.		
16.02 Service, repair and adjust remote speed controls.		
16.03 Service, repair and adjust manual start-stop controls.		
16.04 Service, repair and adjust electrical start-stop controls.		
16.05 Service, repair and adjust zone systems.		
16.06 Service, repair and adjust blade clutch controls.		
16.07 Service, repair and adjust chain brake systems.		
16.08 Comply with the Consumer Protection Act (CPA) for three-second stops.		
16.09 Comply with the CPA for interlocks.		
16.10 Comply with the CPA for blade tip speed.		
16.11 Read and interpret CPA rules and regulations.		
17.0 Understand basic two-stroke and four-stroke engines.-The student will be able to:		
17.01 Explain the basic principles of the operation of two-stroke cycle internal combustion engines.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.02 Identify types of two-stroke cycle engines.		
17.03 Explain the basic principles of the operation of four-stroke cycle internal combustion engines.		
17.04 Identify types of four-stroke cycle engines.		
17.05 Locate engine serial and model numbers.		
17.06 Identify engine assemblies and systems.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Equipment Technology 3**
Course Number: **9504530**
Course Credit: **1**

Course Description:
The Power and Equipment Technology 3 course prepares students for entry into Power and Equipment Technology 4. Students will learn entry-level skills for entry into the outdoor power equipment and other small engine mechanical industries. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of two-stroke and four-stroke cycle engines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.0	Demonstrate proficiency in repairing and maintaining two-stroke cycle engines.-The student will be able to:		
18.01	Explain the basic principles of the operation of two-stroke cycle internal combustion engines.		
18.02	Identify types of two-stroke cycle engines.		
18.03	Locate engine serial and model numbers.		
18.04	Identify engine assemblies and systems.		
18.05	Disassemble engines and inspect parts.		
18.06	Remove, clean and inspect heads for cracks, warpage and damaged spark plug threads.		
18.07	Diagnose powerhead problems by use of the visual inspection method.		
18.08	Diagnose powerhead problems by use of the compression tester method.		
18.09	Diagnose powerhead problems by use of the stethoscope method.		
18.10	Remove, clean and inspect piston and rod assemblies.		
18.11	Measure out-of-round of pistons and cylinders.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.12	Hone cylinders.		
18.13	Check the total bearing surface of connecting rod bearings.		
18.14	Measure piston skirts and ring grooves.		
18.15	Measure the piston ring gap in cylinder bores.		
18.16	Install piston pins according to manufacturer's specifications.		
18.17	Check rod and piston assembly alignment.		
18.18	Install rings on pistons.		
18.19	Install piston rod assemblies.		
18.20	Measure and check crankshafts with a micrometer.		
18.21	Check needle bearings.		
18.22	Inspect crankshafts and install seal.		
18.23	Inspect, clean and/or replace reed valves.		
18.24	Reassemble engines.		
19.0	Demonstrate proficiency in repairing and maintaining basic four-stroke cycle engines.-The student will be able to:		
19.01	Explain the basic principles of the operation of four-stroke cycle internal combustion engines.		
19.02	Identify types of four-stroke cycle engines.		
19.03	Locate engine serial and model numbers.		
19.04	Identify engine assemblies and systems.		
19.05	Diagnose valve and head problems by use of the visual inspection method.		
19.06	Diagnose valve and head problems by use of the compression tester and Leak Down tester method.		
19.07	Disassemble engines and inspect parts.		
19.08	Clean and inspect heads for cracks, warpage and damaged spark plug threads.		
19.09	Inspect valves for warpage, burns, cracks, stem wear, tip wear and margin.		
19.10	Adjust valves.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.11 Remove and inspect camshafts and lifters.		
19.12 Clean and inspect lifters for wear.		
19.13 Time valve drive assemblies.		
19.14 Remove pistons from rod assemblies.		
19.15 Measure out-of-round and cylinder taper with a dial bore gage or micrometer.		
19.16 Check piston pins and bosses for wear.		
19.17 Measure piston ring lands width, out-of-round and taper.		
19.18 Measure the piston ring gap in cylinder bores.		
19.19 Install and fit piston pins.		
19.20 Check rod and piston assembly alignment.		
19.21 Remove and replace rod bearings.		
19.22 Hone and clean cylinders.		
19.23 Install rings on pistons.		
19.24 Measure and check crankshafts with a micrometer.		
19.25 Check for end play.		
19.26 Check bearing bores with a telescoping gage.		
19.27 Reassemble engines.		
19.28 Install oil seals.		
19.29 Inspect/replace timing belt/chain.		
19.30 After rebuild, final Compression Test and Lead Down Test.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Equipment Technology 4**
Course Number: **9504540**
Course Credit: **1**

Course Description:
The Power and Equipment Technology 4 course prepares students for entry into the outdoor power equipment or other small engine equipment workforce or into post-secondary training. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of engine interior components; power transfer systems; industry-related power and equipment; employability skills; acceptable employee behavior; and entrepreneurship.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
20.0	Demonstrate proficiency in repairing engine interior components.-The student will be able to:		
20.01	Service, repair and adjust valve systems.		
20.02	Service, repair and adjust rings, bores and pistons.		
20.03	Service, repair and adjust crankshafts and bearings.		
20.04	Service, repair and adjust rods.		
20.05	Service, repair and adjust lubrication systems.		
20.06	Service, repair and adjust internal governor.		
20.07	Service, repair and adjust internal components timing.		
20.08	Assemble complete engines to manufacturer's specifications.		
20.09	Diagnose causes of component failures to determine if they are due to friction, resulting from poor lubrication or contaminated fuel or to normal wear.		
21.0	Demonstrate proficiency in diagnosing and repairing power transfer systems.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.01	Diagnose and replace power transfer system components.		
21.02	Diagnose and repair manual transmissions.		
21.03	Diagnose and repair differentials.		
21.04	Diagnose and replace drive components.		
21.05	Remove and replace hydraulic pump systems.		
22.0	Demonstrate proficiency in servicing, repairing, and adjusting various types of industry-related power and equipment.-The student will be able to:		
22.01	Service, repair and adjust lawn and garden equipment.		
22.02	Service, repair and adjust commercial golf course equipment.		
22.03	Service, repair and adjust commercial industrial equipment.		
22.04	Service, repair and adjust various industry-related power and equipment.		
23.0	Demonstrate employability skills.-The student will be able to:		
23.01	Conduct a job search using periodicals and the internet.		
23.02	Secure information about a job.		
23.03	Identify documents that may be required when applying for a job interview.		
23.04	Complete a job application form correctly.		
23.05	Demonstrate competence in job interview techniques.		
23.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.		
23.07	Identify acceptable work habits.		
23.08	Demonstrate knowledge of how to make appropriate job changes.		
23.09	Demonstrate acceptable employee health habits.		
23.10	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).		
24.0	Demonstrate proficiency in acceptable employee behavior.-The student will be able to:		
24.01	Explain the effects of chemical/substance abuse.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
24.02	Identify principles of stress management.		
24.03	Identify and define career opportunities in the industry.		
24.04	Explain and identify acceptable work ethics.		
24.05	Explain acceptable dress standards.		
24.06	Identify and demonstrate proper customer relations skills.		
24.07	Identify principles of time management.		
24.08	Identify and define payroll deductions (taxes, insurance, and social security) and employee benefits.		
25.0	Demonstrate an understanding of entrepreneurship.-The student will be able to:		
25.01	Define entrepreneurship.		
25.02	Describe the importance of entrepreneurship to the American economy.		
25.03	List the advantages and disadvantages of business ownership.		
25.04	Identify and explain the risks involved in ownership of a business.		
25.05	Identify and explain the necessary personal characteristics of a successful entrepreneur.		
25.06	Identify and explain the business skills needed to operate a small business efficiently and effectively.		
25.07	Identify and explain the various types of business structures, e.g. sole proprietor, S-Corporation, etc.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Equipment Technology 5**
Course Number: **9504550**
Course Credit: **1**

Course Description:
The Power and Equipment Technology 5 course prepares students for entry into the outdoor power equipment or other small engine equipment workforce or into post-secondary training. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of portable generators.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
26.0	Diagnose, service, repair and adjust portable generators.-The student will be able to:		
26.01	Identify generator components and system rotor assembly, stator, circuit breakers, transformers, relays, transistors, brush and brush holder, and voltage regulator.		
26.02	Diagnose and service generator systems using revolving field excitation methods, direct excitation, brushless excitation method, field boost assembly, power factor, and oil pressure switch on GN engines.		
26.03	Identify and diagnose typical automatic idle control system, troubleshooting idle control, and troubleshooting flow chart for direct excited (brush type generators)		
26.04	Troubleshoot brush type generators using industry recognized troubleshooting flowcharts.		
26.05	Troubleshoot brushless type generators using industry recognized troubleshooting flowcharts.		

Florida Department of Education
Student Performance Standards

Course Title: **Power and Equipment Technology 6**
Course Number: **9504560**
Course Credit: **1**

Course Description:
The Power and Equipment Technology 6 course prepares students for entry into the outdoor power equipment or other small engine equipment workforce or into post-secondary training. Hands-on training combined with laboratory and classroom experiences gives the student a full understanding of basic principles of electronic fuel management systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
27.0 Demonstrate and identify basic principles of electronic fuel management (EFI) systems.-The student will be able to:		
27.01 Diagnose and service fuel pump, module and left pump.		
27.02 Diagnose and service fuel filter, high pressure lines, and fuel pressure gauge.		
27.03 Diagnose and service (injector pop off tool) fuel injector.		
27.04 Diagnose and service electronic control unit (ECU).		
27.05 Diagnose and service engine oil temperature sensor.		
27.06 Diagnose and service throttle control sensor.		
27.07 Troubleshoot malfunction indicator light (MIL) air intake temperature sensor.		
27.08 Troubleshoot, read and interpret wiring harness EFT diagram 6 terminal connectors.		
27.09 Troubleshoot, diagnose, and service using EFI diagnostic flow diagram flowchart.		
27.10 Troubleshoot, diagnose, and service using industry recognized EFI system flowchart.		
27.11 Diagnose and service oxygen sensor.		

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

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Power Equipment Technologies (T400300) courses:

Power Equipment Service Technician 1 - (300 hours)
Power Equipment Service Technician 2 - (300 hours)
Power Equipment Service Technician 3 - (300 hours)

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)

SkillsUSA is the intercurricular career and technical student organization 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.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Unmanned Aircraft Systems (UAS) Operations**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9505100
CIP Number	0615080104
Grade Level	9 – 12
Standard Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	Technology Student Association, SkillsUSA
SOC Codes (all applicable)	17-3024 – Electro-Mechanical Technicians 49-3011 – Aircraft Mechanics and Service Technicians

Purpose

The purpose of this program is to prepare students for employment and advanced educational training in the emerging aviation industry of unmanned aircraft systems (UAS). Instruction is designed to prepare students for Federal Aviation Administration (FAA) ground school examinations for Private Pilot rating. Federal Aviation Regulation (FAR) Part 61 identifies minimum requirements for completing this examination, which is required to complete the FAR Part 107 examination to achieve a Remote Pilot License. This program prepares students for employment in the field of UAS both as a Pilot, Operations Technician, and a Line-of-Sight Observer.

This program focuses on broad, transferable skills, stresses understanding of all aspects of the UAS growing industry, and demonstrates elements of the industry such as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

The following table illustrates the Secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9540610	Private Pilot Ground School	AIR MECH @7 7G AVIONICS @7 7G AEROSPACE 7G	1 credit	49-3011	3	
	9505110	Unmanned Aircraft Systems (UAS) Operations 1	ENG TEC 7G	1 credit	17-3024	3	
	9505120	Unmanned Aircraft Systems (UAS) Operations 2	TEC ED 1@2	1 credit	17-3024	3	
B	9505130	Unmanned Aircraft Systems (UAS) Operations 3	ENG&TEC ED1@2	1 credit	17-3024	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9540610	**	**	**	**	**	**	**	**	**	**	**
9505110	**	**	**	**	**	**	**	**	**	**	**
9505120	**	**	**	**	**	**	**	**	**	**	**
9505130	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9540610	**	**	**	**	**	**	**
9505110	**	**	**	**	**	**	**
9505120	**	**	**	**	**	**	**
9505130	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate an understanding of safe and effective work practices.
02.0 Demonstrate an understanding of fundamentals of flight.
03.0 Understand and explain Federal Aviation Administration Regulations.
04.0 Demonstrate understanding of meteorology.
05.0 Demonstrate knowledge of aircraft communication equipment.
06.0 Demonstrate knowledge and understanding of aircraft propulsion and associated systems.
07.0 Demonstrate an understanding of navigation systems and procedures.
08.0 Demonstrate flight planning skills.
09.0 Demonstrate effective communication skills.
10.0 Demonstrate analytical skills.
11.0 Demonstrate understanding of applied sciences.
12.0 Describe human factors related to safe aircraft operation.
13.0 Describe the flight training process.
14.0 Describe aircraft safety of flight principles.
15.0 Describe the Airport Environment.
16.0 Demonstrate an understanding of the basics of unmanned aerial systems (UAS).
17.0 Demonstrate an understanding why safety considerations and regulations are necessary.
18.0 Understand the basic rules of safe operations.
19.0 Demonstrate an understanding of the principles of flight.
20.0 Understand UAS propulsion and power.
21.0 Understand the types of control.
22.0 Understand material science.
23.0 Understand core components and assembly.
24.0 Demonstrate and execute basic UAS operations.
25.0 Demonstrate understanding of regulations and aeronautics principles
26.0 Demonstrate understanding of mission planning, preparation, execution, and post flight debrief.
27.0 Review current regulations.
28.0 Describe potential impacts from UAS operations.
29.0 Demonstrate and execute troubleshooting.
30.0 Demonstrate and execute maintenance.
31.0 Understand aeronautical principles.
32.0 Understand weather and weather reporting.
33.0 Execute mission planning.
34.0 Demonstrate a practical application of mission planning.
35.0 Demonstrate and execute mission preparation and UAS design.
36.0 Demonstrate and execute advanced UAS construction.
37.0 Create and execute mission flight plan.
38.0 Analyze and evaluate the mission.

Florida Department of Education
Student Performance Standards

Course Title: **Private Pilot Ground School**
Course Number: **9540610**
Course Credit: **1**

Course Description:
The Private Pilot Ground School course prepares students for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation pilot/mechanic. Students study general shop safety, fundamentals of flight, FAA regulations, meteorology, aircraft communications, propulsion, and navigation systems, flight planning, communication and analytical skills, applied sciences, safe aircraft operation and principles, flight training processes, and airport environments.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci, and FAA

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 61
01.0	Demonstrate an understanding of safe and effective work practices.-The student will be able to:			
01.01	Demonstrate an awareness and understanding of fueling operations.			
01.02	Demonstrate an understanding of situational awareness.			
01.03	Demonstrate an awareness and understanding of fire hazards, and how to control and extinguish fires.			
01.04	Demonstrate an awareness and understanding for the need of safety devices, controls, guards and equipment.			
02.0	Demonstrate an understanding of fundamentals of flight.-The student will be able to:			
02.01	Name and compare the four forces of flight.			
02.02	Describe the structural components of an aircraft.			
02.03	Describe airfoil design factors.			
02.04	Explain how an airfoil produces lift using Bernoulli's principles and Newton's Laws of Force and Motion.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 61
	02.05 Discuss how and why an airplane stalls and spins.			
	02.06 Describe the function of aircraft flight controls and their effect on aircraft pitch, roll, and yaw.			
	02.07 Describe and explain the operation and use of pitot/static, vacuum/gyroscopic, pressure and engine instruments.			
	02.08 Explain factors affecting aircraft design, performance, and operation.			
03.0	Understand and explain Federal Aviation Administration Regulations.-The student will be able to:			
	03.01 Explain major portion of Parts 1, 61, 91, 135, 141 and NTSB 830 of the Federal Aviation Regulations.			
04.0	Demonstrate understanding of meteorology.-The student will be able to:			
	04.01 Describe the composition, circulation and stability of the atmosphere.			
	04.02 Demonstrate an understanding of air mass development, the movement of fronts and their effect on aviation.			
	04.03 Demonstrate an awareness of weather hazards to aviation and an understanding of how to avoid them.			
	04.04 Demonstrate the ability to access weather information prior to and during flights through a variety of media.			
	04.05 Interpret printed reports, forecasts and graphic weather products.			
05.0	Demonstrate knowledge of aircraft communication equipment.-The student will be able to:			
	05.01 Use and explain aircraft voice communication equipment.			
	05.02 Explain function and use of ELT's, voice recorders, and other emergency communication systems.			
	05.03 Demonstrate use of proper phraseology in ATC communications.			
	05.04 Discuss uses and limitations of portable transceivers.			
	05.05 Demonstrate use of phonetic alphabet.			
06.0	Demonstrate knowledge and understanding of aircraft propulsion and associated systems.-The student will be able to:			
	06.01 Describe and identify reciprocating and turbine engine components.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 61
06.02	Compare the merits of fixed and variable pitch propellers.			
06.03	Describe a typical lubrication system.			
06.04	Describe a typical aircraft electrical system, including a magneto ignition systems and proper magneto checks.			
06.05	Describe the difference between a normally aspirated engine and one that is supercharged or turbocharged.			
06.06	Describe the difference between gravity fed and pump fed fuel systems.			
06.07	Demonstrate basic operation of an aircraft engine, including proper interpretation of instruments and use of appropriate engine controls.			
07.0	Demonstrate an understanding of navigation systems and procedures.-The student will be able to:			
07.01	Distinguish between latitude and longitude.			
07.02	Define radio navigation.			
07.03	Explain the operation of the magnetic compass, including compass errors.			
07.04	Describe and demonstrate use of VOR equipment and navigation.			
07.05	Describe the operation of GPS navigation equipment.			
07.06	Explain DME principles.			
07.07	Explain sectional charts and their use.			
07.08	Explain lost communications emergency procedures under VFR.			
07.09	Plot and explain a route of flight.			
07.10	Differentiate different classes of airspace and usage within the FAA national airspace system.			
08.0	Demonstrate flight planning skills.-The student will be able to:			
08.01	Explain major portions of Parts 1, 91 and NTSB 830 of the Federal Aviation Rules and Regulations.			
08.02	Define weight and balance.			
08.03	Define center of gravity, moment, datum line, CG envelope,			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 61
	basic empty weight, and gross weight.			
08.04	Calculate, compute, and solve given weight and balance problems.			
08.05	Demonstrate acquisition of appropriate weather data.			
08.06	Demonstrate proper selection of destination/enroute/alternate airports.			
08.07	Explain fuel requirements.			
08.08	Read and interpret performance charts to predict aircraft performance.			
08.09	Demonstrate the use of a flight computer.			
08.10	Access and analyze NOTAMS.			
08.11	Define and describe the various phases of flight.			
08.12	Explain the function of a pilot logbook.			
08.13	Prepare a VFR flight plan.			
08.14	Demonstrate familiarity with various published sources of flight information (Airfield Directories, NOTAMS, Aeronautical Information Manual, and Advisory Circulars).			
09.0	Demonstrate effective communication skills.-The student will be able to:			
09.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.			
09.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.			
09.03	Read and follow written and oral English instructions.			
09.04	Answer and ask questions coherently and concisely.			
09.05	Demonstrate telephone/communication skills.			
09.06	Demonstrate knowledge and use of appropriate computer skills.			
09.07	Demonstrate interpersonal skills.			
10.0	Demonstrate analytical skills.-The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 61
	10.01 Add, subtract, multiply and divide using fractions, decimals, whole numbers, percentages, and ratios.			
	10.02 Demonstrate understanding and use of the metric system.			
11.0	Demonstrate understanding of applied sciences.-The student will be able to:			
	11.01 Draw conclusions or make inferences from data.			
	11.02 Understand pressure measurement in terms of P.S.I., inches of mercury, and metric.			
12.0	Describe human factors related to safe aircraft operation.-The student will be able to:			
	12.01 Describe effects of the flight environment on human physiology.			
	12.02 Describe the effects of alcohol and drugs on human performance.			
	12.03 Explain crew resource management (CRM).			
	12.04 Describe situational awareness (SA).			
	12.05 Describe aeronautical decision making (ADM) skills.			
13.0	Describe the flight training process.-The student will be able to:			
	13.01 Define various pilot certificates and ratings (private, instrument, multi-engine, commercial, certified flight instructor (CFI/CFII/MEI), and airline transport pilot (ATP).			
	13.02 List and describe both professional and non-professional aviation opportunities.			
14.0	Describe aircraft safety of flight principles.-The student will be able to:			
	14.01 Summarize techniques of collision avoidance, including proper visual scanning and right of way rules.			
	14.02 Describe minimum safe altitude (MSA) and preparation for flight over hazardous terrain.			
	14.03 Describe proper ground taxi techniques.			
	14.04 Summarize the airport traffic pattern (entry, altitudes, turns, legs, and departure).			
15.0	Describe the airport environment.-The student will be able to:			
	15.01 Describe the configuration of airports, including runways			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	FAA FAR Part 61
taxiways markings and signs.			
15.02 Describe airport lighting (runways, taxiways, beacons, and approach lighting systems).			

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Florida Department of Education
Student Performance Standards

Course Title: **Unmanned Aircraft Systems (UAS) Operations 1**
Course Number: **9505110**
Course Credit: **1**

Course Description:
The Unmanned Aircraft Systems (UAS) Operations 1 course prepares students for entry into the UAS aviation industry. Students explore a basic understanding of the operational aspects that are key to the requirements that are necessary to be part of the professional UAS Aviation Industry. Students study general operational principles and flight safety requirements to perform mission flight profiles, environmental concerns, mathematics, physics, basic aerodynamics, federal aviation regulations, publications and required records.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci, and FAA

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	FAA FAR Part 107
16.0 Demonstrate an understanding of the basics of unmanned aerial systems (UAS).-The student will be able to:			
16.01 Define UAS.			
16.02 Describe the development of UAS technology.			
16.03 Describe how UAS and their uses have changed over time.			
16.04 Categorize basic UAS types.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 107
	16.05 Explain the role of UAS communities and networks.			
17.0	Demonstrate an understanding why safety considerations and regulations are necessary.-The student will be able to:			
	17.01 Explain harm and damage from inappropriate use.			
	17.02 Demonstrate basic understanding of restrictions of UAS flights.			
18.0	Understand the basic rules of safe operations.-The student will be able to:			
	18.01 Describe appropriate locations and flight conditions.			
	18.02 Describe basic requirements for safe operations.			
19.0	Demonstrate an understanding of the basic principles of flights.-The student will be able to:			
	19.01 Identify the structure and components of a UAS aircraft.			
	19.02 Explain the four forces of flight.			
	19.03 Explain the basic characteristics of roll, pitch, and yaw.			
20.0	Understand UAS propulsion and power.-The student will be able to:			
	20.01 Define and explain the two types of propulsion.			
	20.02 Describe the function and types of batteries used with UAS.			
	20.03 Describe the properties and functions of propellers.			
21.0	Understand the types of control.-The student will be able to:			
	21.01 Describe and explain various levels of operator versus computer control.			
	21.02 Identify and classify various communication methods.			
22.0	Understand material science.-The student will be able to:			
	22.01 Compare and contrast different materials used in airframe construction.			
	22.02 Describe and demonstrate soldering methods.			
23.0	Understand core components and assembly.-The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 107
	23.01 Identify core components used in UAS.			
	23.02 Select appropriate components for use in UAS.			
	23.03 Identify tools and equipment for UAS assembly.			
	23.04 Assemble and configure the assigned UAS.			
	23.05 Test system preflight functionality.			
	23.06 Install and configure external payloads.			
24.0	Demonstrate and execute basic UAS operations.-The student will be able to:			
	24.01 Identify the components of the pre-flight checklist.			
	24.02 Execute pre-flight check.			
	24.03 Execute in-flight operations.			
	24.04 Define the roles of a UAS flight-crew.			
	24.05 Describe and explain the stages of flight: prep, takeoff, flight profile, landing, and recovery.			
	24.06 Perform and execute responses to the proposed flight profile and recovery.			
	24.07 Identify elements of the post flight-checklist.			
	24.08 Execute post-flight check.			

Florida Department of Education
Student Performance Standards

Course Title: **Unmanned Aircraft Systems (UAS) Operations 2**
Course Number: **9505120**
Course Credit: **1**

Course Description:
The Unmanned Aircraft Systems (UAS) Operations 2 course prepares and introduces students to the flight operations associated with the UAS aviation industry. Students examine and explore the applicable of regulations at the Federal, State, and local level as they relate to UAS and manned flight operations. Students are also introduced to the unique governing aspects of flight operations conducted within the National Airspace System (NAS). This course includes introduction to flight navigation, weather, mission planning, software, hardware, and firmware associated with UAS activities. Students continue to examine the aspects associated with environmental concerns, mathematics, physics, advanced aerodynamics, publications, and required records keeping.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci, and FAA

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 107
25.0	Demonstrate understanding of regulations and aeronautics principles.- The student will be able to:			
25.01	Review and understand federal regulations that govern UAS operations.			
25.02	Research current state and local regulations that govern UAS operations.			
25.03	Describe current applications of UAS operations.			
25.04	Examine political, economic, and social impacts of UAS operations.			
25.05	Describe different classifications of airspace within the U.S.			
25.06	Identify the 24-hour clock and the associated phonetic alphabet.			
25.07	Identify features of an aeronautical charts.			
25.08	Describe and explain weather and weather reporting.			
25.09	Review and examine different mission planning.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 107
	25.10 Develop flight planning dynamics using programmable software.			
	25.11 Program and configure software flight plan.			
26.0	Demonstrate understanding of mission planning, preparation, execution, and post flight debrief.-The student will be able to:			
	26.01 Organize and research the assigned mission.			
	26.02 Develop a flight plan/profile with defined outcomes.			
	26.03 Communicate mission flight plan/profile to flight crew.			
	26.04 Use designed hardware and software to define mission flight plan/profile.			
	26.05 Perform flight plan/profile briefing with Remote Pilot in Charge (RPIC) and flight crew.			
	26.06 Execute flight plan/profile.			
	26.07 Analyze and evaluate mission.			
	26.08 Format and analyze mission data.			
	26.09 Review mission and develop conclusions and present mission finding.			
	26.10 Evaluate and critique mission results.			
27.0	Review current regulations.-The student will be able to:			
	27.01 Review and Understand current federal regulations governing UAS operations.			
	27.02 Research current state and local regulations governing UAS operations.			
28.0	Describe potential impacts from UAS operations.-The student will be able to:			
	28.01 Research current applications of UAS operations.			
	28.02 Explain political, economic, and societal impacts of UAS operations.			
	28.03 Research UAS post-secondary training and careers.			
29.0	Demonstrate and execute troubleshooting.-The student will be able to:			
	29.01 Establish and execute a troubleshooting theory.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	FAA FAR Part 107
29.02 Apply theory to solve common UAS hardware, software, firmware, and communications problems.			
30.0 Demonstrate and execute maintenance.-The student will be able to:			
30.01 Select and use appropriate maintenance tools.			
30.02 Demonstrate and execute in-flight tuning to meet performance requirements.			
30.03 Apply appropriate repair/maintenance procedures.			
31.0 Understand aeronautical principles.-The student will be able to:			
31.01 Identify and use phonetic alphabet and Zulu time.			
31.02 Define and classify designated airspace.			
31.03 Identify features and read aeronautical maps.			
32.0 Understand weather and weather reporting.-The student will be able to:			
32.01 Explain how weather impacts UAS operations.			
32.02 Explain and interpret weather reports.			
33.0 Execute mission planning.-The student will be able to:			
33.01 Select appropriate platform for a specific mission.			
33.02 Configure flight plan using appropriate programs and software.			
33.03 Configure transmitter and software for appropriate flight modes, and deploy.			

Florida Department of Education
Student Performance Standards

Course Title: **Unmanned Aircraft Systems (UAS) Operations 3**
Course Number: **9505130**
Course Credit: **1**

Course Description:
The Unmanned Aircraft Systems (UAS) Operations 3 course prepares students for executing mission planning and design elements necessary to prototype new industry standards to meet the changing mission requirements as technology continues to adapt and advance. Students explore advanced mission planning from basic organization to enhanced and complex flight profiles. Students study advance operational principles and UAS design and development to support new designs necessary to perform every changing mission flight profiles. This will include environmental concerns, mathematics, physics, basic aerodynamics, federal aviation regulations, publications, and required records.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 61
34.0	Demonstrate a practical application of mission planning.-The student will be able to:			
34.01	Organize and research the mission.			
34.02	Develop a project plan with defined outcomes.			
34.03	Communicate a project plan with stakeholders, backers, and support agency.			
35.0	Demonstrate and execute mission preparation and UAS design.-The student will be able to:			
35.01	Use appropriate hardware and software to create UAS design.			
35.02	Assemble all components, software, and tools needed to build a prototype UAS for a designated mission profile.			
35.03	Identify basic and advanced setup for a UAS.			
36.0	Demonstrate and execute advanced UAS construction.-The student will be able to:			
36.01	Create and utilize a design to build, modify and enhance a UAS.			
36.02	Modify and adjust components and/or payload.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	FAA FAR Part 61
36.03 Apply setup procedures to test, calibrate and optimize the UAS.			
37.0 Create and execute mission flight plan.-The student will be able to:			
37.01 Create a flight plan.			
37.02 Configure system for a specific flight plan.			
37.03 Execute a specific flight plan.			
38.0 Analyze and evaluate the mission.-The student will be able to:			
38.01 Format and analyze mission data.			
38.02 Draw conclusions and present mission findings.			
38.03 Describe and summarize mission with a wrap-up and debrief.			
38.04 Evaluate and critique mission results.			

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.

Classroom, shop, and laboratory activities are an integral part of this program. FAR Section 107.21(e) requires teaching of at least 50 percent of the curriculum in the shop or laboratory. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes found in the industry. Equipment and supplies should be provided to enhance hands-on experiences for students in the chosen occupation.

Special Notes

Refer to FAA FAR Part 61, 107 and industry publications for more information about required levels of proficiency, hours of instruction, and updates to occupational titles and training requirements. Keeping pace with the standards of industry and maintaining a high quality of training requires ongoing linkages with industry and FAA.

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)

SkillsUSA is the intercurricular career and technical student organization 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. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Collision Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

SECONDARY – Career Preparatory	
Program Number	9514000
CIP Number	0647060305
Grade Level	9 – 12
Standard Length	6 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3021- Automotive Body and Related Repairers

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to basic trade skills; refinishing skills; sheetmetal repair skills; frame and unibody squaring and aligning; use of fillers; paint systems and undercoats; related welding skills; related mechanical skills; trim-hardware maintenance; glass servicing; and other miscellaneous repairs. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices.

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

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.

Benchmarks identified with a designation of HP-I and HP-G are NATEF tasks.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9514010	Automotive Collision Paint and Body Assistant	AUTO IND @7 %7 %G AUTO BODY @7 7G	1 credit	49-3021	2	
	9514020	Automotive Collision Paint and Refinishing Assistant 1		1 credit		2	
	9514030	Automotive Collision Paint and Refinishing Assistant 2		1 credit		2	
B	9514040	Automotive Collision Paint and Refinishing Assistant 3		1 credit	49-3021	2	
	9514050	Automotive Collision Non-Structural Damage Assistant 1		1 credit		2	
C	9514060	Automotive Collision Non-Structural Damage Assistant 2		1 credit	49-3021	2	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9514040	**	**	**	**	**	**	**	**	**	**	**
9514020	**	**	**	**	**	**	**	**	**	**	**
9514030	**	**	**	**	**	**	**	**	**	**	**
9514040	**	**	**	**	**	**	**	**	**	**	**
9514050	**	**	**	**	**	**	**	**	**	**	**
9504060	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9514040	**	**	**	**	**	**	**
9514020	**	**	**	**	**	**	**
9514030	**	**	**	**	**	**	**
9514040	**	**	**	**	**	**	**
95104050	**	**	**	**	**	**	**
9514060	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Proficiently explain and apply required shop and personal safety tasks relating to the automotive collision industry.
02.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive collision industry.
03.0 Demonstrate proficiency in preparing vehicle for repairs and customer services.
04.0 Explain and apply safety precautions; spray gun and related equipment operation; and surface preparation.
05.0 Explain and apply safety precautions; spray gun and related equipment operation; paint mixing, matching and applying; and paint defects (causes and cures).

06.0 Explain and apply safety precautions; spray gun and related equipment operation; and final detailing.
07.0 Explain and apply safety precautions; preparation; outer body panel repairs, replacements, and adjustments; metal finishing and body filling.
08.0 Explain and apply safety precautions; movable glass and hardware; plastics and adhesives; electrical; and brakes.

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Collision Paint and Body Assistant**
Course Number: **9514010**
Course Credit: **1**

Course Description:
The Automotive Collision Paint and Body Assistant course prepares students for entry into the Automotive Collision and Repair industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study equipment skills, safety regulations, routine maintenance, and customer service.

For every task in Automotive Collision Paint and Body Assistant course, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hearing protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle system hazard types (Supplemental Restraint System (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
ASE = Supplemental Tasks

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
01.0	Proficiently explain and apply required shop and personal safety tasks relating to the automotive collision industry.-The student will be able to:			
01.01	Identify and apply general shop safety rules and procedures, EPA and OSHA standards.	ASE		
01.02	Demonstrate knowledge of related Industry Certifications.			
01.03	Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).			
01.04	Identify and use appropriate emergency first aid procedures.			
01.05	Utilize and demonstrate safe procedures for handling of hand tools, lifting tools, jack stands, and related equipment.	ASE		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
01.06	Utilize and identify proper PPE, ventilation and safety procedures for working within the lab/shop area, and be able to identify and use fire extinguishers, SDS, posted evacuation routes and eye wash stations.	ASE		
02.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive collision industry.-The student will be able to:			
02.01	Identify tools and equipment and their appropriate usage in automotive applications.	ASE		
02.02	Identify, apply and use standard and metric measurement skills and designation.	ASE		
02.03	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE		
03.0	Demonstrate proficiency in preparing vehicle for repairs and customer services.-The student will be able to:			
03.01	Identify information needed and the service requested on a repair order.	ASE		
03.02	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.			
03.03	Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.	ASE		
03.04	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE		
03.05	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.			
03.06	Check operation and status of instrument panel warning lights and gauges.			
03.07	Locate and use the Vehicle Identification Number (VIN), information placards, decals, tags, as required.			
03.08	Check fluid levels, replace as required.			
03.09	Inspect undercar area for leaks, damage, and unusual conditions.			
03.10	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.			
03.11	Inspect cooling system pipes and hoses for wear, damage, and proper routing.			
03.12	Reinstall wheel; torque wheel fasteners to specification.			

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
03.13 Perform a visual inspection of a disc brake system.			
03.14 Charge battery as needed.			
03.15 Inspect and clean battery and battery cable clamp connections.			
03.16 Perform battery, starting, and charging system tests using appropriate tester.			
03.17 Start vehicle using an auxiliary power supply.			
03.18 Maintain or restore electronic memory functions if required.			

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Collision Paint an Refinishing Assistant 1**
Course Number: **9514020**
Course Credit: **1**

Course Description:
The Automotive Collision Paint and Refinishing Assistant 1 course prepares students for entry into the Automotive Collision and Repair industry. Students study safety precautions; spray gun and related equipment operation; and surface preparation.

For every task in Automotive Collision Paint and Refinishing Assistant 1 course, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle system hazard types (Supplemental Restraint System (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
PR = Painting and Refinishing

PR Task List:	
HP-I =	28
HP-G =	06
Total	34

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
04.0 Explain and apply safety precautions; spray gun and related equipment operation; and surface preparation.-The student will be able to:			
Safety Precautions			
04.01 Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.	HP-I		
04.02 Identify safety and personal health hazards according to OSHA guidelines and the Federal Law as recorded in (29 CFR-1910.1200).	HP-I		
04.03 Inspect spray environment and equipment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards.	HP-I		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
04.04 Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I		
04.05 Select and identify a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I		
04.06 Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).	HP-I		
Spray Gun and Related Equipment Operation			
04.07 Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).	HP-I		
04.08 Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.	HP-I		
04.09 Test and adjust spray gun using fluid, air and pattern control valves.	HP-I		
04.10 Demonstrate an understanding of the operation of pressure spray equipment.	HP-G		
Surface Preparation			
04.11 Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.	HP-I		
04.12 Inspect and identify type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system.	HP-G		
04.13 Remove paint finish as needed.	HP-I		
04.14 Dry or wet sand areas to be refinished.	HP-I		
04.15 Featheredge areas to be refinished.	HP-I		
04.16 Apply suitable metal treatment or primer in accordance with total product systems.	HP-I		
04.17 Creatively identify, mask and protect other areas that will not be refinished.	HP-I		
04.18 Creatively demonstrate different masking techniques (recess/back masking, foam door type, etc.).	HP-G		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
04.19 Creatively mix primer, primer-surfacer or primer-sealer.	HP-I		
04.20 Artistically identify a complimentary color or shade of undercoat to improve coverage.	HP-G		
04.21 Artistically apply primer onto surface of repaired area.	HP-I		
04.22 Artistically apply two-component finishing filler to minor surface imperfections.	HP-I		
04.23 Block sand area to which primer-surfacer has been applied.	HP-I		
04.24 Dry sand area to which finishing filler has been applied.	HP-I		
04.25 Remove dust from area to be refinished, including cracks or moldings of adjacent areas.	HP-I		
04.26 Clean area to be refinished using a final cleaning solution.	HP-I		
04.27 Remove, with a tack rag, any dust or lint particles from the area to be refinished.	HP-I		
04.28 Artistically apply suitable primer sealer to the area being refinished.	HP-I		
04.29 Creatively scuff sand to remove nibs or imperfections from a sealer.	HP-I		
04.30 Creatively and artistically apply stone chip resistant coating.	HP-G		
04.31 Restore caulking and seam sealers to repaired areas.	HP-G		
04.32 Prepare panels for blending as needed.	HP-I		
04.33 Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I		
04.34 Identify metal parts to be refinished; determine the materials needed, preparation, and refinishing procedures.	HP-I		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Collision Paint and Refinishing Assistant 2**
Course Number: **9514030**
Course Credit: **1**

Course Description:
The Automotive Collision Paint and Refinishing Assistant 3 course prepares students for entry into the Automotive Collision and Repair industry. Students study safety precautions; surface preparation; spray gun and related equipment operation; paint mixing, matching and applying; and paint defects (causes and cures).

For every task in Automotive Collision Paint and Refinishing Assistant 2 course, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle system hazard types (Supplemental Restraint System (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
PR = Painting and Refinishing

PR Task List:	
HP-I = 28	
HP-G = 25	
Total	**53**

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.0 Explain and apply safety precautions; spray gun and related equipment operation; paint mixing, matching and applying; and paint defects (causes and cures).-The student will be able to:			
Safety Precautions			
05.01 Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.	HP-I		
05.02 Identify safety and personal health hazards according to OSHA guidelines and the Federal Law as recorded in (29 CFR-1910.1200).	HP-I		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.03 Inspect spray environment and equipment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards.	HP-I		
05.04 Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I		
05.05 Select and identify a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I		
05.06 Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).	HP-I		
Spray Gun and Related Equipment Operation			
05.07 Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).	HP-I		
05.08 Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.	HP-I		
05.09 Test and adjust spray gun using fluid, air and pattern control valves.	HP-I		
05.10 Demonstrate an understanding of the operation of pressure spray equipment.	HP-G		
Paint Mixing, Matching, and Applying			
05.11 Identify color code by manufacturer's vehicle information label.	HP-I		
05.12 Shake, stir, reduce, catalyze/activate, and strain refinish materials.	HP-I		
05.13 Artistically apply finish using appropriate spray techniques (gun arc, angle, distance, travel speed, and spray pattern overlap) for the finish being applied.	HP-I		
05.14 Artistically apply selected product on test or let-down panel; check for color match.	HP-I		
05.15 Artistically apply single stage topcoat.	HP-G		
05.16 Artistically apply basecoat/clearcoat for panel blending and panel refinishing.	HP-I		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.17 Artistically apply basecoat/clearcoat for overall refinishing.	HP-G		
05.18 Remove nibs or imperfections from basecoat.	HP-I		
05.19 Identify product expiration dates as applicable.	HP-G		
05.20 Artistically refinish plastic parts.	HP-I		
05.21 Artistically apply multi-stage coats for panel blending and overall refinishing.	HP-G		
05.22 Identify and mix paint using a formula.	HP-I		
05.23 Identify poor hiding colors; determine necessary action.	HP-G		
05.24 Creatively and artistically tint color using formula to achieve a blendable match.	HP-I		
05.25 Identify alternative color formula to achieve a blendable match.	HP-I		
05.26 Identify the materials equipment, and preparation differences between solvent and waterborne technologies.	HP-G		
Paint Defects – Causes and Cures			
05.27 Identify blistering (raising of the paint surface, air entrapment); correct the cause(s) and the condition.	HP-G		
05.28 Identify a dry spray appearance in the paint surface; correct the cause(s) and the condition.	HP-I		
05.29 Identify the presence of fish-eyes (crater-like openings) in the finish; correct the cause(s) and the condition.	HP-I		
05.30 Identify lifting; correct the cause(s) and the condition.	HP-G		
05.31 Identify clouding (mottling and streaking in metallic finishes); correct the cause(s) and the condition.	HP-I		
05.32 Identify orange peel; correct the cause(s) and the condition.	HP-I		
05.33 Identify overspray; correct the cause(s) and the condition.	HP-I		
05.34 Identify solvent popping in freshly painted surface; correct the cause(s) and the condition.	HP-G		
05.35 Identify sags and runs in paint surface; correct the cause(s) and the condition.	HP-I		
05.36 Identify sanding marks or sandscratch swelling; correct the cause(s) and the condition.	HP-I		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
05.37 Identify contour mapping/edge mapping; correct the cause(s) and the condition.	HP-G		
05.38 Identify color difference (off-shade); correct the cause(s) and the condition.	HP-G		
05.39 Identify tape tracking; correct the cause(s) and the condition.	HP-G		
05.40 Identify low gloss condition; correct the cause(s) and the condition.	HP-G		
05.41 Identify poor adhesion; determine the cause(s) and correct the condition.	HP-G		
05.42 Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, micro-checking, etc.); correct the cause(s) and the condition.	HP-G		
05.43 Identify corrosion; correct the cause(s) and the condition.	HP-G		
05.44 Identify dirt or dust in the paint surface; correct the cause(s) and the condition.	HP-I		
05.45 Identify water spotting; correct the cause(s) and the condition.	HP-G		
05.46 Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.	HP-G		
05.47 Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition.	HP-G		
05.48 Identify die-back conditions (dulling of the paint film showing haziness); correct the cause(s) and the condition.	HP-G		
05.49 Identify chalking (oxidation); correct the cause(s) and the condition.	HP-G		
05.50 Identify bleed-through (staining); correct the cause(s) and the condition.	HP-G		
05.51 Identify pin-holing; correct the cause(s) and the condition.	HP-G		
05.52 Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition.	HP-I		
05.53 Identify pigment flotation (color change through film build); correct the cause(s) and the condition.	HP-G		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Collision Paint and Refinishing Assistant 3**
Course Number: **9514040**
Course Credit: **1**

Course Description:
The Automotive Collision Paint and Refinishing Assistant 3 course prepares students for entry into the Automotive Collision and Repair industry. Students study safety precautions; surface preparation; spray gun and related equipment operation; and final detailing.

For every task in Automotive Collision Paint and Refinishing Assistant 3 course, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle system hazard types (Supplemental Restraint System (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
PR = Painting and Refinishing

PR Task List:	
HP-I =	14
HP-G =	03
Total	17

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.0 Explain and apply safety precautions; spray gun and related equipment operation; and final detailing.-The student will be able to:			
Safety Precautions			
06.01 Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.	HP-I		
06.02 Identify safety and personal health hazards according to OSHA guidelines and the Federal Law as recorded in (29 CFR-1910.1200).	HP-I		
06.03 Inspect spray environment and equipment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards.	HP-I		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
06.04 Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I		
06.05 Select and identify a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.	HP-I		
06.06 Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).	HP-I		
Spray Gun and Related Equipment Operation			
06.07 Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).	HP-I		
06.08 Select spray gun setup (fluid needle, nozzle, and cap) for product being applied.	HP-I		
06.09 Test and adjust spray gun using fluid, air and pattern control valves.	HP-I		
06.10 Demonstrate an understanding of the operation of pressure spray equipment.	HP-G		
Final Detail			
06.11 Identify the procedures to apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc.	HP-G		
06.12 Sand, buff and polish fresh or existing finish to remove defects as required.	HP-I		
06.13 Clean interior, exterior, and glass.	HP-I		
06.14 Clean body openings (door jambs and edges, etc.).	HP-I		
06.15 Remove overspray.	HP-I		
06.16 Perform vehicle clean-up; complete quality control using a checklist.	HP-I		
06.17 Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	HP-G		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Collision Non-Structural Damage Assistant 1**
Course Number: **9514050**
Course Credit: **1**

Course Description:
The Automotive Collision Non-Structural Damage Assistant 1 course prepares students for entry into the Automotive Collision and Repair industry. Students study safety the preparation; outer body panel repairs, replacements, and adjustments; and metal finishing and body filling.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
NAD = Non-Structural Analysis and Damage Repair

For every task in Automotive Collision Non-Structural Damage Assistant 1 course, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hearing protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle system hazard types (Supplemental Restraint System (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.

NAD Task List:	
HP-I =	26
HP-G =	12
Total	38

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
07.0 Explain and apply safety precautions; preparation; outer body panel repairs, replacements, and adjustments; metal finishing and body filling.-The student will be able to:			
Safety Precautions			
07.01 Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials in accordance with federal, state, and local regulations.	HP-I		
07.02 Locate procedures and precautions that may apply to the vehicle being repaired.	HP-I		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
07.03	Identify vehicle system hazard types (supplemental restraint system (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.	HP-I		
07.04	Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA regulation 1910.134 and applicable state and local regulation.	HP-I		
Preparation				
07.05	Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.	HP-I		
07.06	Inspect, remove, store, protect, and replace exterior trim and components necessary for proper surface preparation.	HP-I		
07.07	Inspect, remove, label, store, and reinstall necessary trim and moldings.	HP-I		
07.08	Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair.	HP-I		
07.09	Inspect, remove, protect label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair.	HP-G		
07.10	Protect panels, glass, interior parts, and other vehicles adjacent to the repair area.	HP-I		
07.11	Soap and water wash entire vehicle; complete pre-repair inspection checklist.	HP-I		
07.12	Prepare damaged area using water-based and solvent-based cleaners.	HP-I		
07.13	Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs.	HP-I		
07.14	Determine the presence of a Tire Pressure Monitoring System (TPMS).			
07.15	Determine the presence of wheel locks.			
07.16	Determine the presence of an air suspension system.			
07.17	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE		
07.18	Identify procedures to reset maintenance indicators.			
07.19	Verify status of instrument panel warning lights and gauges.			

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
07.20 Test and replace fuses; confirm proper circuit operation.			
07.21 Inspect and replace exterior and courtesy lamps.			
07.22 Document damage, unusual conditions, and concerns.			
Outer Body Panel Repairs, Replacements, and Adjustments			
07.23 Inspect/locate direct, indirect, or hidden damage and direction of impact.	HP-I		
07.24 Inspect, remove and replace mechanically fastened welded steel panel or panel assemblies.	HP-G		
07.25 Determine the extent of damage to aluminum body panels; repair or replace.	HP-G		
07.26 Inspect, remove, replace, and align hood, hood hinges, and hood latch. (when available)	HP-I		
07.27 Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.	HP-I		
07.28 Inspect, remove, replace, and align doors, latches, hinges, and related hardware. (when available)	HP-I		
07.29 Inspect, remove, replace and align tailgates, hatches, liftgates and sliding doors. (when available)	HP-G		
07.30 Inspect, remove, replace, and align bumper bars, covers, reinforcements, guards, impact absorbers, and mounting hardware.	HP-I		
07.31 Inspect, remove, replace and align fenders, and related panels.	HP-I		
07.32 Restore corrosion protection during and after the repair.	HP-I		
07.33 Identify procedures to replace door skins.	HP-G		
07.34 Identify procedures to restore sound deadeners and foam materials.	HP-G		
07.35 Identify procedures to perform panel bonding and weld bonding.	HP-G		
07.36 Identify procedures to diagnose and repair water leaks, dust leaks, and wind noise.	HP-G		
07.37 Identify one-time use fasteners.	HP-G		
07.38 Identify procedures to weld damaged or torn steel body panels; repaired broken welds.	HP-G		
Metal Finishing and Body Filling			

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
07.39	Prepare a panel for body filler by abrading or removing the coatings; featheredge and refine scratches before the application of body filler.	HP-I		
07.40	Locate and repair surface irregularities on a damaged body panel using power tools, hand tools, and weld-on pulling attachments.	HP-I		
07.41	Demonstrate hammer and dolly techniques.	HP-I		
07.42	Identify procedures to Hot or cold shrink stretched panel areas to proper contour.	HP-I		
07.43	Identify body filler defects; correct the cause and condition. (Pinholing, ghosting, staining, over catalyzing, etc.)	HP-I		
07.44	Identify different types of body fillers.	HP-G		
07.45	Shape body filler to contour; finish sand.	HP-I		
07.46	Identify the processes to Perform proper metal finishing techniques for ferrous and non-ferrous metals.	HP-G		
07.47	Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments.	HP-I		

Florida Department of Education
Student Performance Standards

Course Title: **Automotive Collision Non-Structural Damage Assistant 2**
Course Number: **9514060**
Course Credit: **1**

Course Description:
The Automotive Collision Non-Structural Damage Assistant 2 course prepares students for entry into the Automotive Collision and Repair industry. Students study safety the preparation; movable glass and hardware; plastics and adhesives; electrical; and brakes.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science
NAD = Non-Structural Analysis and Damage Repair

For every task in Automotive Collision Non-Structural Damage Assistant 2 course, the following safety requirement MUST be strictly enforced:

Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hearing protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle system hazard types (Supplemental Restraint System (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.

NAD Task List:	
HP-I =	28
HP-G =	21
Total	49

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
08.0 Explain and apply safety precautions; movable glass and hardware; plastics and adhesives; electrical; and brakes.-The student will be able to:			
Safety Precautions			
08.01 Select and use proper personal safety equipment; take necessary precautions with hazardous operations and materials in accordance with federal, state, and local regulations.	HP-I		
08.02 Locate procedures and precautions that may apply to the vehicle being repaired.	HP-I		
08.03 Identify vehicle system hazard types (supplemental restraint system (SRS), hybrid/electric/alternative fuel vehicles), locations and recommended procedures before inspecting or replacing components.	HP-I		

CTE Standards and Benchmarks	Priority Number	FS-M/LA	NGSSS-Sci
08.04 Select and use a NIOSH approved air purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA regulation 1910.134 and applicable state and local regulation.	HP-I		
Moveable Glass and Hardware			
08.05 Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.	HP-I		
08.06 Inspect, adjust, repair, remove, reinstall or replace weather-stripping.	HP-G		
08.07 Identify procedures to Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.	HP-G		
08.08 Inspect, remove, reinstall, and align convertible top and related mechanisms.	HP-G		
08.09 Identify procedures to initialize electrical components as needed.	HP-G		
Plastics and Adhesives			
08.10 Identify the types of plastics; determine repairability.	HP-I		
08.11 Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures.	HP-I		
08.12 Repair rigid, semi-rigid, or flexible plastic panels.	HP-I		
08.13 Remove or repair damaged areas from rigid exterior composite panels.	HP-G		
08.14 Replace bonded rigid exterior composite body panels; straighten or align panel supports.	HP-G		
08.15 Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair.	HP-I		
Electrical			
08.16 Identify processes and procedures to check for available voltage, voltage drop and current, and resistance in electrical wiring circuits and components with a DMM (digital multi-meter).	HP-I		
08.17 Identify processes and procedures to repair wiring and connectors.	HP-I		
08.18 Identify processes and procedures to inspect, test, and replace fusible links, circuit breakers, and fuses.	HP-I		
08.19 Identify processes and procedures to perform battery state-of-charge test and slow/fast battery charge.	HP-I		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
08.20	Identify processes and procedures to inspect, clean, repair or replace battery, battery cables, connectors and clamps.	HP-I		
08.21	Dispose of batteries and battery acid according to local, state, and federal requirements.	HP-G		
08.22	Identify programmable electrical/electronic components and check for malfunction indicator lamp (MIL) and fault codes; record data for reprogramming before disconnecting battery.	HP-I		
08.23	Identify processes and procedures to inspect alignment, adjust, remove and replace alternator (generator), drive belts, pulleys, and fans.	HP-I		
08.24	Check operation and aim headlamp assemblies and fog/driving lamps; determine needed repairs.	HP-I		
08.25	Identify processes and procedures to inspect, test, and repair or replace bulbs, sockets, connectors, and ground wires of interior and exterior light circuits.	HP-I		
08.26	Identify processes and procedures to remove and replace horn(s); check operation.	HP-I		
08.27	Identify processes and procedures to check operation of wiper/washer systems; determine needed repairs.	HP-I		
08.28	Identify processes and procedures to check operation of power side and tailgate window; determine needed repairs.	HP-I		
08.29	Identify processes and procedures to inspect, remove and replace power seat, motors, linkages, cables, etc.	HP-G		
08.30	Identify processes and procedures to inspect, remove and replace components of electric door and hatch/trunk lock.	HP-G		
08.31	Identify processes and procedures to inspect, remove and replace components of keyless lock/unlock devices and alarm systems.	HP-G		
08.32	Identify processes and procedures to inspect, remove and replace components of electrical sunroof and convertible/retractable hard top.	HP-G		
08.33	Identify processes and procedures to check operation of electrically heated mirrors, windshields, back lights, panels, etc.; determine needed repairs.	HP-I		
08.34	Identify processes and procedures to demonstrate the proper self-grounding procedures (anti-static) for handling electronic components.	HP-I		
08.35	Identify processes and procedures to check for module communication errors using a scan tool.	HP-G		
08.36	Identify processes and procedures to use wiring diagrams, component location, and diagnostic flow charts during diagnosis of electrical circuit problems.	HP-G		

CTE Standards and Benchmarks		Priority Number	FS-M/LA	NGSSS-Sci
08.37	Identify processes and procedures to identify safe disabling techniques of high voltage systems on hybrid/electric vehicles.	HP-G		
08.38	Identify processes and procedures to identify potential safety and material handling concerns associated with high voltage hybrid/electric vehicle battery systems.	HP-G		
Brakes				
08.39	Identify processes and procedures to inspect brake lines, hoses, and fittings for damage or wear; tighten fittings and supports; replace brake lines (double flare and ISO types).	HP-G		
08.40	Identify processes and procedures to replace hoses, fittings, seals, and supports.	HP-I		
08.41	Identify processes and procedures to identify, handle, store, and fill with appropriate brake fluids.	HP-G		
08.42	Identify processes and procedures to bleed (manual, pressure, or vacuum) hydraulic brake system.	HP-I		
08.43	Identify processes and procedures to pressure test brake hydraulic system; determine necessary action.	HP-G		
08.44	Identify processes and procedures to adjust brake shoes or pads; remove and reinstall brake drums or drum/hub assemblies.	HP-I		
08.45	Identify processes and procedures to remove, clean and inspect caliper and rotor assembly and mountings for wear and damage; reinstall.	HP-I		
08.46	Identify processes and procedures to inspect parking brake system operation; repair or adjust as necessary; verify operation.	HP-I		
08.47	Identify processes and procedures to identify the proper procedures for handling brake dust.	HP-G		
08.48	Identify processes and procedures to check for bent or damaged brake system components.	HP-G		
08.49	Identify processes and procedures to demonstrate an understanding of various types of advanced braking systems (ABS, electronic parking brake, hydraulic, electronic, traction and stability control).	HP-G		

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

Benchmarks identified with a designation of HP-I and HP-G are NATEF tasks.

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)

SkillsUSA 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Cooperative Training – OJT

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

Accommodations

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

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

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Mobile Electronics Technology**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9540400
CIP Number	0647010105
Grade Level	9 – 12
Standard Length	2 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles

Purpose

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

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

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in network support services positions.

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9540410	Mobile Electronics Technology 1	AUTO MECH @7 7G COMP SVC 7 7G ELECTRONIC @7 7G	1 credit	49-2096	2	
B	9540420	Mobile Electronics Technology 2		1 credit	49-2096	2	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9540410	**	**	**	**	**	**	**	**	**	**	**
9540420	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9540410	**	**	**	**	**	**	**
9540420	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate proficiency in acceptable employee behavior in the automotive industry.
02.0 Demonstrate appropriate communication skills.
03.0 Demonstrate proficiency in appropriate math skills as it relates to the mobile electronics industry.
04.0 Demonstrate proficiency in appropriate understanding of basic sciences.
05.0 Demonstrate proficiency in preparing a vehicle for pre/post customer requested installations or services.
06.0 Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
07.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
08.0 Explain the importance of employability and entrepreneurship skills
09.0 Demonstrate proficiency in electrical basics.
10.0 Demonstrate proficiency in evaluating and assessing vehicle power sources.
11.0 Demonstrate proficiency in locating and repairing common installation and electrical problems in automobiles.
12.0 Demonstrate a working knowledge of direct current circuits (DC).
13.0 Demonstrate a working knowledge of alternating current (AC) circuits.
14.0 Demonstrate proficiency in locating and troubleshooting common installation and electrical problems in automobiles.
15.0 Demonstrate a working knowledge of vehicle electrical systems.
16.0 Demonstrate a working knowledge of OBD systems.
17.0 Demonstrate knowledge of basic mobile audio/video systems.
18.0 Demonstrate a working knowledge of security and convenience systems.
19.0 Demonstrate a working knowledge of advanced in-vehicle information and control systems.
20.0 Demonstrate knowledge of basic telematics systems using wireless communications.
21.0 Demonstrate proficiency in evaluating and assessing various circuits in a vehicle where aftermarket components will connect.
22.0 Demonstrate proficiency in the evaluation and installation of basic and advanced automotive audio system elements, enhancements or the replacement of audio system components.
23.0 Demonstrate proficiency in the evaluation and installation of basic and advanced automotive security and convenience elements and components.
24.0 Demonstrate knowledge of a Wireless Local Area Network (WLAN).
25.0 Demonstrate knowledge of lighting systems (i.e. H.I.D, LED, halogen lights).
26.0 Demonstrate a working knowledge of basic installation knowledge and techniques.
27.0 Demonstrate proficiency in the installation of Rear Seat Entertainment (RSE) Systems.

Florida Department of Education
Student Performance Standards

Course Title: **Mobile Electronics Technology 1**
Course Number: **9540410**
Course Credit: **1**

Course Description:
The Mobile Electronics Technology 1 course content includes, but is not limited to, installation, configuration, operation, and maintenance of Mobile Audio/Video Systems; Autosound, Wireless Communications, Security, Navigation, In-Vehicle Information Systems, Safety Systems, Satellite Antenna, and low voltage wiring systems. Other course content includes, but is not limited to, communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate proficiency in occupational safety.-The student will be able to:		
01.01	List the level of electricity (shock) considered lethal to humans.		
01.02	Describe safety considerations when working in and around motor vehicles.		
01.03	Apply shop safety rules, EPA and OSHA standards.		
01.04	Explain the measurement and safety concerns of sound pressure level and hearing damage.		
01.05	Identify and use appropriate emergency first aid procedures.		
01.06	Describe the Federal Law as recorded in (29 CFR-1910.1200).		
01.07	Utilize and demonstrate safe procedures for handling of tools and equipment.		
01.08	Identify and use proper placement of floor jacks and jack stands.		
01.09	Identify and use proper procedures for safe lift operation.		
01.10	Utilize proper ventilation procedures for working within the lab/shop area.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.11	Identify marked safety areas.		
01.12	Identify the location and the types of fire extinguishers and other fire safety equipment.		
01.13	Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.		
01.14	Identify the location and use of eye wash stations.		
01.15	Identify the location of the posted evacuation routes.		
01.16	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.		
01.17	Identify and wear appropriate clothing for lab/shop activities.		
01.18	Secure hair and jewelry for lab/shop activities.		
01.19	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.		
01.20	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.		
01.21	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)		
01.22	Locate and demonstrate knowledge of safety data sheets (SDS).		
02.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the mobile electronics industry.-The student will be able to:		
02.01	Identify tools and equipment and their appropriate usage in mobile electronics applications.		
02.02	Identify and use standard and metric measurement skills and designation.		
02.03	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.		
02.04	Demonstrate proper use of precision-measuring tools and torque methods.		
02.05	Identify, use and maintain hand and power tools properly.		
02.06	Identify and practice using appropriate precision measuring tools and torque methods.		
02.07	Identify and describe the proper tools to apply and remove automotive fasteners, to include thread repair.		
02.08	Identify and use metric and English measurement skills.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
03.0	Demonstrate proficiency in acceptable employee behavior in the automotive industry.-The student will be able to:		
03.01	Explain the effects of chemical/substance abuse.		
03.02	Identify principles of stress management.		
03.03	Demonstrate acceptable industry dress code.		
03.04	Identify and demonstrate proper customer relation skills.		
03.05	Identify and define payroll deductions (taxes, insurance, and social security) employee benefits and pay systems.		
03.06	Identify principles of time management.		
03.07	Identify acceptable customer relations.		
04.0	Demonstrate appropriate communication skills.-The student will be able to:		
04.01	Write logical and understandable statements, or phrases, to accurately fill out forms and invoices commonly used in business and industry.		
04.02	Read and use graphs, charts, diagrams, tables, parts manuals, and information sources commonly used in this industry/occupational area.		
04.03	Read and follow written and oral instructions.		
04.04	Answer and ask questions coherently and concisely.		
04.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
04.06	Demonstrate appropriate telephone/communication skills.		
05.0	Demonstrate proficiency in appropriate math skills as it relates to the mobile electronics industry.-The student will be able to:		
05.01	Read and interpret measuring devices.		
05.02	Solve number word problems.		
05.03	Write percent add fractions and decimals.		
05.04	Solve percent problems.		
05.05	Find the percent of a number.		
05.06	Operate a calculator.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.07	Understand and use the metric system.		
05.08	Convert inches to millimeters and millimeters to inches.		
05.09	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
05.10	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.		
05.11	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
05.12	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
06.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:		
06.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
06.02	Draw conclusions or make inferences from data.		
06.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
06.04	Understand pressure measurement in terms of Pounds per Square Inch (P.S.I.), inches of mercury (inHg) and kilopascals (K.P.A.)		
07.0	Demonstrate proficiency in preparing a vehicle for pre/post customer requested installations or services.-The student will be able to:		
07.01	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.		
07.02	Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.		
07.03	Determine the presence of a Tire Pressure Monitoring System (TPMS).		
07.04	Determine the presence of an air suspension system.		
07.05	Locate and use the Vehicle Identification Number (VIN).		
07.06	Locate and use vehicle information placards, decals, tags, as required.		
07.07	Locate and use technical service bulletins (TSBs).		
07.08	Read and understand manufacturer’s specification sheets, equipment installation instructions and equipment owner’s manuals.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.09	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).		
07.10	Use computer and operate keyboard.		
07.11	Identify automobiles according to vehicle identification number (VIN)		
07.12	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.		
08.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.-The students will be able to:		
08.01	Describe the nature and types of business organizations.		
08.02	Explain the effect of key organizational systems on performance and quality.		
08.03	List and describe quality control systems and/or practices common to the workplace.		
08.04	Explain the impact of the global economy on business organizations.		
09.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.-The students will be able to:		
09.01	Employ leadership skills to accomplish organizational goals and objectives.		
09.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.		
09.03	Conduct and participate in meetings to accomplish work tasks.		
09.04	Employ mentoring skills to inspire and teach others.		
10.0	Explain the importance of employability and entrepreneurship skills.-The student will be able to:		
10.01	Identify and demonstrate positive work behaviors needed to be employable.		
10.02	Develop personal career plan that includes goals, objectives, and strategies.		
10.03	Examine licensing, certification, and industry credentialing requirements.		
10.04	Maintain a career portfolio to document knowledge, skills, and experience.		
10.05	Evaluate and compare employment opportunities that match career goals.		
10.06	Identify and exhibit traits for retaining employment.		
10.07	Identify opportunities and research requirements for career advancement.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.08	Research the benefits of ongoing professional development.		
10.09	Examine and describe entrepreneurship opportunities as a career planning option.		
11.0	Demonstrate proficiency in electrical basics.-The student will be able to:		
11.01	Identify sources of electricity.		
11.02	Relate electricity to the nature of matter.		
11.03	Define voltage, current, resistance, power and energy.		
11.04	Apply Ohm's law and power formulas.		
11.05	Measure properties of a circuit using appropriate test equipment.		
11.06	Demonstrate electrostatic discharge (ESD) safety procedures.		
11.07	Read and interpret color codes and symbols to identify electrical/electronic components and values.		
11.08	Solve problems in electronic units utilizing metric prefixes.		
12.0	Demonstrate proficiency in evaluating and assessing vehicle power sources.-The student will be able to:		
12.01	Charge battery as needed.		
12.02	Inspect and clean battery and battery cable clamp connections.		
12.03	Perform battery test using appropriate tester.		
12.04	Start vehicle using an auxiliary power supply.		
12.05	Maintain or restore electronic memory functions if required.		
12.06	Test and replace fuses, fusible links; confirm proper circuit operation.		
12.07	Identify battery by group, type and purpose.		
12.08	Determine the correct battery type to use in a variety of applications.		
12.09	Demonstrate knowledge of hybrid electrical power storage units.		
12.10	Demonstrate knowledge of safe battery handling and disposal procedures according to local, state and federal regulations.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.0	Demonstrate proficiency in locating and repairing common installation and electrical problems in automobiles.-The student will be able to:		
13.01	Diagnose a voltage drop against a known good reference measurement.		
13.02	Evaluate short circuits and determine how they can originate.		
13.03	Locate and repair a short circuit between two points.		
13.04	Evaluate open circuits and determine how they can originate.		
13.05	Locate and repair an open circuit between two points.		
13.06	Measure and evaluate critical components for proper functioning.		
13.07	Describe the components used in soldering.		
13.08	Perform Soldered connections.		
13.09	Determine if soldering is appropriate for a particular installation situation.		
13.10	Use wiring diagrams to trace electrical/electronic circuits.		
13.11	Demonstrate the proper use of a digital multi-meter (DMM) when measuring source, voltage drop (including grounds), current flow, and resistance.		
13.12	Check operation of electrical circuits with a test light.		
13.13	Check operation of electrical circuits using fused jumper wires.		
13.14	Measure key-off battery drain (parasitic draw).		
13.15	Describe the characteristics and functions of various automotive relays and some of their common applications.		
13.16	Describe the characteristics and functions of various diodes and some of their common applications.		
14.0	Demonstrate a working knowledge of direct current circuits (DC).-The student will be able to:		
14.01	Measure properties of a DC circuit using DVOM meter and scopes.		
14.02	Apply Ohm's law to series circuits.		
14.03	Construct and verify operation of series circuits.		
14.04	Analyze and troubleshoot series circuits.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	14.05 Verify the operation of parallel circuits.		
	14.06 Analyze and troubleshoot parallel circuits.		
	14.07 Apply Ohm's law to parallel circuits.		
	14.08 Construct and verify the operation of series-parallel circuits.		
	14.09 Troubleshoot combination circuits.		
	14.10 Describe magnetic properties of circuits and devices.		
	14.11 Determine the physical and electrical characteristics of capacitors and inductors.		
	14.12 Define DC motor theory and operation.		
15.0	Demonstrate a working knowledge of alternating current (AC) circuits.-The student will be able to:		
	15.01 Identify properties of an AC signal.		
	15.02 Identify AC sources.		
	15.03 Analyze and measure AC signals utilizing DMM and scopes.		
	15.04 Define the characteristics of AC capacitive circuits.		
	15.05 Define the characteristics of AC inductive circuits.		
	15.06 Define AC motor theory and operation.		
	15.07 Define basic generator theory and operation.		
	15.08 Apply OHM’s law to AC circuits		
16.0	Demonstrate proficiency in locating and troubleshooting common installation and electrical problems in automobiles.-The student will be able to:		
	16.01 Describe the overall effect of voltage drops and determine the points at which they can originate.		
	16.02 Measure voltage drops between two points.		
	16.03 Troubleshoot a voltage drop against a known good reference measurement.		
	16.04 Evaluate short circuits and determine how they can originate.		
	16.05 Locate and repair a short circuit between two points.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.06 Evaluate open circuits and determine how they can originate.		
16.07 Locate and repair an open circuit between two points.		
16.08 Measure and evaluate critical components for proper functioning.		
17.0 Demonstrate a working knowledge of vehicle electrical systems.-The student will be able to:		
17.01 Define basic transistor theory and operation.		
17.02 Define basic Operational amplifier theory and operation.		
17.03 Define basic Integrated Circuit theory and operation.		
17.04 Define basic Logic Gate theory and operation.		
17.05 Define basic Switching Power Supply theory and operation.		
17.06 Define basic Data Bus Systems and Serial Data theory.		
17.07 Define basic Electronic Control Units and Sensors theory and operation.		
17.08 Define basic Multimedia and Control Network theory and operation.		
17.09 Define basic Hybrid Gas-electric Vehicle theory and operation.		
17.10 Identify High-voltage systems.		
17.11 Define basic integrated motor generator theory and operation.		
18.0 Demonstrate a working knowledge of On–Board Diagnostic systems (OBD).-The student will be able to:		
18.01 Describe OBD I system operation and limitations.		
18.02 Describe OBD II system operation and limitations.		

Florida Department of Education
Student Performance Standards

Course Title: **Mobile Electronics Technology 2**
Course Number: **9540420**
Course Credit: **1**

Course Description:
The Mobile Electronics Technology 2 course content includes, but is not limited to, installation, configuration, operation, and maintenance of Mobile Audio/Video Systems; Auto-Sound, Wireless Communications, Security, Navigation, In-Vehicle Information Systems, Safety Systems, Satellite Antenna, and low voltage wiring systems. Other course content includes, but is not limited to, communication, leadership skills, human relations and employability skills; and safe, efficient work practices.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate proficiency in occupational safety.-The student will be able to:		
01.01	List the level of electricity (shock) considered lethal to humans.		
01.02	Describe safety considerations when working in and around motor vehicles.		
01.03	Apply shop safety rules, EPA and OSHA standards.		
01.04	Explain the measurement and safety concerns of sound pressure level and hearing damage.		
01.05	Identify and use appropriate emergency first aid procedures.		
01.06	Describe the Federal Law as recorded in (29 CFR-1910.1200).		
01.07	Utilize and demonstrate safe procedures for handling of tools and equipment.		
01.08	Identify and use proper placement of floor jacks and jack stands.		
01.09	Identify and use proper procedures for safe lift operation.		
01.10	Utilize proper ventilation procedures for working within the lab/shop area.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.11	Identify marked safety areas.		
01.12	Identify the location and the types of fire extinguishers and other fire safety equipment.		
01.13	Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.		
01.14	Identify the location and use of eye wash stations.		
01.15	Identify the location of the posted evacuation routes.		
01.16	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.		
01.17	Identify and wear appropriate clothing for lab/shop activities.		
01.18	Secure hair and jewelry for lab/shop activities.		
01.19	Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.		
01.20	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.		
01.21	Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)		
01.22	Locate and demonstrate knowledge of safety data sheets (SDS).		
02.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the mobile electronics industry.-The student will be able to:		
02.01	Identify tools and equipment and their appropriate usage in mobile electronics applications.		
02.02	Identify and use standard and metric measurement skills and designation.		
02.03	Demonstrate proper cleaning, storage, and maintenance of tools and equipment.		
02.04	Demonstrate proper use of precision-measuring tools and torque methods.		
02.05	Identify, use and maintain hand and power tools properly.		
02.06	Identify and practice using appropriate precision measuring tools and torque methods.		
02.07	Identify and describe the proper tools to apply and remove automotive fasteners, to include thread repair.		
02.08	Identify and use metric and English measurement skills.		
03.0	Demonstrate proficiency in acceptable employee behavior in the automotive industry.-The		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	student will be able to:		
	03.01 Explain the effects of chemical/substance abuse.		
	03.02 Identify principles of stress management.		
	03.03 Demonstrate acceptable industry dress code.		
	03.04 Identify and demonstrate proper customer relation skills.		
	03.05 Identify and define payroll deductions (taxes, insurance, and social security) employee benefits and pay systems.		
	03.06 Identify principles of time management.		
	03.07 Identify acceptable customer relations.		
04.0	Demonstrate appropriate communication skills.-The student will be able to:		
	04.01 Write logical and understandable statements, or phrases, to accurately fill out forms and invoices commonly used in business and industry.		
	04.02 Read and use graphs, charts, diagrams, tables, parts manuals, and information sources commonly used in this industry/occupational area.		
	04.03 Read and follow written and oral instructions.		
	04.04 Answer and ask questions coherently and concisely.		
	04.05 Read critically by recognizing assumptions and implications and by evaluating ideas.		
	04.06 Demonstrate appropriate telephone/communication skills.		
05.0	Demonstrate proficiency in appropriate math skills as it relates to the mobile electronics industry.-The student will be able to:		
	05.01 Read and interpret measuring devices.		
	05.02 Solve number word problems.		
	05.03 Write percent add fractions and decimals.		
	05.04 Solve percent problems.		
	05.05 Find the percent of a number.		
	05.06 Operate a calculator.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.07	Understand and use the metric system.		
05.08	Convert inches to millimeters and millimeters to inches.		
05.09	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
05.10	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.		
05.11	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
05.12	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
06.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:		
06.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
06.02	Draw conclusions or make inferences from data.		
06.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
06.04	Understand pressure measurement in terms of Pounds per Square Inch (P.S.I.), inches of mercury (inHg) and kilopascals (K.P.A.)		
07.0	Demonstrate proficiency in preparing a vehicle for pre/post customer requested installations or services.-The student will be able to:		
07.01	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.		
07.02	Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.		
07.03	Determine the presence of a Tire Pressure Monitoring System (TPMS).		
07.04	Determine the presence of an air suspension system.		
07.05	Locate and use the Vehicle Identification Number (VIN).		
07.06	Locate and use vehicle information placards, decals, tags, as required.		
07.07	Locate and use technical service bulletins (TSBs).		
07.08	Read and understand manufacturer’s specification sheets, equipment installation instructions and equipment owner’s manuals.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.09	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).		
07.10	Use computer and operate keyboard.		
07.11	Identify automobiles according to vehicle identification number (VIN)		
07.12	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.		
08.0	Describe the roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.-The students will be able to:		
08.01	Describe the nature and types of business organizations.		
08.02	Explain the effect of key organizational systems on performance and quality.		
08.03	List and describe quality control systems and/or practices common to the workplace.		
08.04	Explain the impact of the global economy on business organizations.		
09.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.-The students will be able to:		
09.01	Employ leadership skills to accomplish organizational goals and objectives.		
09.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.		
09.03	Conduct and participate in meetings to accomplish work tasks.		
09.04	Employ mentoring skills to inspire and teach others.		
10.0	Explain the importance of employability and entrepreneurship skills.-The student will be able to:		
10.01	Identify and demonstrate positive work behaviors needed to be employable.		
10.02	Develop personal career plan that includes goals, objectives, and strategies.		
10.03	Examine licensing, certification, and industry credentialing requirements.		
10.04	Maintain a career portfolio to document knowledge, skills, and experience.		
10.05	Evaluate and compare employment opportunities that match career goals.		
10.06	Identify and exhibit traits for retaining employment.		
10.07	Identify opportunities and research requirements for career advancement.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.08 Research the benefits of ongoing professional development.		
10.09 Examine and describe entrepreneurship opportunities as a career planning option.		
15.0 Demonstrate a working knowledge of vehicle electrical systems.-The student will be able to:		
15.01 Define basic transistor theory and operation.		
15.02 Define basic Operational amplifier theory and operation.		
15.03 Define basic Integrated Circuit theory and operation.		
15.04 Define basic Logic Gate theory and operation.		
15.05 Define basic Switching Power Supply theory and operation.		
15.06 Define basic Data Bus Systems and Serial Data theory.		
15.07 Define basic Electronic Control Units and Sensors theory and operation.		
15.08 Define basic Multimedia and Control Network theory and operation.		
15.09 Define basic Hybrid Gas-electric Vehicle theory and operation.		
15.10 Identify High-voltage systems.		
15.11 Define basic integrated motor generator theory and operation.		
16.0 Demonstrate a working knowledge of On–Board Diagnostic systems (OBD).-The student will be able to:		
16.01 Describe OBD I system operation and limitations.		
16.02 Describe OBD II system operation and limitations.		
17.0 Demonstrate knowledge of basic mobile audio/video systems.-The student will be able to:		
17.01 Demonstrate proper vehicle disassembly for audio system installations.		
17.02 Identify audio source formats.		
17.03 Identify Mobile audio source units.		
17.04 Identify head unit installation considerations.		
17.05 Demonstrate OEM Integration of audio inputs.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.06 Identify and explain proper operation of OEM interface devices.		
17.07 Define basic audio signal processing theory and operation.		
17.08 Define basic mobile audio amplifiers theory and operation.		
17.09 Define basic active and passive crossover networks theory and operation.		
17.10 Identify speaker types and enclosures.		
17.11 Define basic sound fundamentals.		
17.12 Demonstrate speaker installation		
17.13 Define basic digital and multi-channel sound theory and operation.		
17.14 Define basic video theory and operation.		
17.15 Identify video output formats.		
17.16 Demonstrate OEM audio integration with a video system installation.		
17.17 Identify troubleshooting steps for common video system installation problems.		
18.0 Demonstrate a working knowledge of security and convenience systems.-The student will be able to:		
18.01 Demonstrate proper vehicle disassembly for security and convenience installations.		
18.02 Identify OEM anti-theft systems.		
18.03 Discuss advanced security topics.		
18.04 Demonstrate proper identification of vehicle circuits.		
18.05 Demonstrate proper security system placement and mounting.		
18.06 Demonstrate troubleshooting common security system problems.		
18.07 Identify security and convenience system accessories.		
18.08 Demonstrate alternative security system applications.		
18.09 Demonstrate remote start system installation.		
18.10 Identify critical remote starter connections.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.11 Demonstrate proper OEM security interface and bypass for remote starter installation.		
	18.12 Identify safety considerations required while installing and configuring a remote start system.		
	18.13 Identify troubleshooting steps for remote start systems.		
19.0	Demonstrate a working knowledge of advanced in-vehicle information and control systems.-The student will be able to:		
	19.01 Identify relevant data presented to drivers.		
	19.02 Identify types of data available via satellite.		
	19.03 Identify methods for sending data from vehicles.		
	19.04 Identify subscription services.		
	19.05 Demonstrate installation of satellite radio systems.		
	19.06 Demonstrate installation of consumer telemetric systems.		
	19.07 Demonstrate installation of 2-way radio communication systems.		
	19.08 Demonstrate methods for integration and interfacing with on-board diagnostic systems.		
	19.09 Identify troubleshooting steps for in-vehicle information systems.		
20.0	Demonstrate knowledge of basic telematics systems using wireless communications.-The student will be able to:		
	20.01 Explain basic procedures for pairing smart phone systems.		
	20.02 Explain basic function and operation of navigation systems.		
	20.03 Explain basic function and operation of intelligent warning and detection systems.		
	20.04 Explain the basic function and operation of satellite infotainment systems.		
21.0	Demonstrate proficiency in evaluating and assessing various circuits in a vehicle where aftermarket components will connect.-The student will be able to:		
	21.01 Evaluate the vehicle’s ability to support aftermarket equipment, in particular audio amplifiers.		
	21.02 Determine electrical upgrades according electrical demands.		
	21.03 Evaluate OEM ignition switch wiring and associated circuits.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.04	Determine the polarity and function of wire connected to the ignition switch.		
21.05	Determine the polarity and function of wires connected to the headlight switch.		
21.06	Determine the polarity and function of each wire connected to the trunk release switch.		
21.07	Determine the polarity and function of each wire connected to the foot brake switch.		
21.08	Determine the polarity and function of each wire connected to the door lock/unlock switch.		
22.0	Demonstrate proficiency in the evaluation and installation of basic and advanced automotive audio system elements, enhancements or the replacement of audio system components.-The student will be able to:		
22.01	Determine the physical characteristics of an aftermarket head unit.		
22.02	Determine what connections and installation accessories are required for a particular head unit replacement.		
22.03	Install an aftermarket head unit.		
22.04	Determine the physical characteristics of aftermarket speakers.		
22.05	Determine what connections and installation accessories are required for a particular set of replacement speakers.		
22.06	Install aftermarket speakers.		
22.07	Determine the physical characteristics of aftermarket amplifier.		
22.08	Determine what connections and installation accessories are required for a particular amplifier.		
22.09	Install an aftermarket amplifier.		
22.10	Connect multiple speakers to a single channel.		
22.11	Perform both series and parallel wiring configurations noting the electrical characteristics of each.		
22.12	Perform amplifier bridging to one speaker.		
22.13	Perform amplifier bridging to two speakers.		
22.14	Install an aftermarket amplifier in an OEM system.		
22.15	Install and configure an aftermarket head unit in an OEM system.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	22.16 Install an aftermarket power antenna.		
	22.17 Describe situations where resistors, relays and diodes need to be added to an automotive infotainment system.		
23.0	Demonstrate proficiency in the evaluation and installation of basic and advanced automotive security and convenience elements and components.-The student will be able to:		
	23.01 Determine the physical characteristics of an aftermarket security system.		
	23.02 Determine what connections and installation accessories are required to interface a particular security system with the vehicle.		
	23.03 Install, program and configure an aftermarket security system.		
	23.04 Describe situations when relays and diodes need to be added to an automotive security system.		
	23.05 Install relays, resistors and diodes in an automotive security system.		
	23.06 Determine the physical characteristics of a remote starter system.		
	23.07 Determine what connections are required to interface a particular remote starter system with the vehicle.		
	23.08 Install, program and configure a remote starter system.		
24.0	Demonstrate knowledge of a Wireless Local Area Network (WLAN).-The student will be able to:		
	24.01 Describe the standards associated with wireless media.		
	24.02 Identify and describe the purpose of the components of a small WLAN.		
	24.03 Describe small WLAN technologies and their applications in the mobile electronics industry.		
	24.04 Demonstrate knowledge of how security features and capabilities of WI-FI Protected Access (WPA) operate.		
	24.05 Describe common issues with implementing a WLAN and methods for addressing these issues.		
	24.06 Describe common issues with implementing Blue-tooth communications and applications (APPS)		
25.0	Demonstrate knowledge of lighting systems (i.e. H.I.D, LED, halogen lights).-The student will be able to:		
	25.01 Explain the safety concerns associated with the use of High-Intensity Discharge (H.I.D) lighting, halogen bulbs, and other lighting systems.		
	25.02 Describe the operation of the primary and secondary voltage systems used in High-Intensity Discharge (H.I.D) lighting.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	25.03 Describe the testing procedures of the primary voltage systems used in High-Intensity Discharge (H.I.D) lighting.		
	25.04 Describe the proper installation of Light-Emitting Diodes (LED) lighting.		
26.0	Demonstrate a working knowledge of basic installation knowledge and techniques.-The student will be able to:		
	26.01 Identify and use power and pneumatic tools properly.		
	26.02 Demonstrate general vehicle disassembly.		
	26.03 Demonstrate basic fabrication techniques and proper use of fabrication materials.		
	26.04 Demonstrate acceptable electronic testing and proper use of test equipment.		
	26.05 Define basic aftermarket amplifier installation and operation.		
	26.06 Identify troubleshooting steps for aftermarket amplifier problems.		
27.0	Demonstrate proficiency in the installation of Rear Seat Entertainment (RSE) Systems.-The student will be able to:		
	27.01 Determine the physical characteristics of a standalone rear seat entertainment system.		
	27.02 Determine what connections are required to interface a particular stand-alone rear seat entertainment system with the vehicle.		
	27.03 Install, program and configure a standalone rear seat entertainment system.		
	27.04 Integrate the sound from the video system through the OEM audio 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)

SkillsUSA is the intercurricular career and technical student organization 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.

Cooperative Training – OJT

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

Accommodations

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

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

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified

for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Motorcycle Service Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9540500
CIP Number	0647061101
Grade Level	9 – 12
Standard Length	8 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3052 – Motorcycle Mechanics

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to the motorcycle services technology industry, and demonstrates such elements of the industry as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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

Program Structure

This program is a planned sequence of instruction consisting of four occupational completion points.

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

The following table illustrates the secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	8766110	Motorcycle Service 1	MOTORCYCLE @7 7G	1 credit	49-3052	2	
B	8766120 8766130	Motorcycle Service 2 Motorcycle Service 3		1 credit 1 credit	49-3052	2 2	
C	8766140 8766150	Motorcycle Service 4 Motorcycle Service 5		1 credit 1 credit	49-3052	2 2	
D	8766160 8766170 8766180	Motorcycle Service 6 Motorcycle Service 7 Motorcycle Service 8		1 credit 1 credit 1 credit	49-3052	2 2 2	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
8766110	**	**	**	**	**	**	**	**	**	**	**
8766120	**	**	**	**	**	**	**	**	**	**	**
8766130	**	**	**	**	**	**	**	**	**	**	**
8766140	**	**	**	**	**	**	**	**	**	**	**
8766150	**	**	**	**	**	**	**	**	**	**	**
8766160	**	**	**	**	**	**	**	**	**	**	**
8766170	**	**	**	**	**	**	**	**	**	**	**
8766180	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
8766110	**	**	**	**	**	**	**
8766120	**	**	**	**	**	**	**
8766130	**	**	**	**	**	**	**
8766140	**	**	**	**	**	**	**
8766150	**	**	**	**	**	**	**
8766160	**	**	**	**	**	**	**
8766170	**	**	**	**	**	**	**
8766180	**	**	**	**	**	**	**

*** Alignment pending review* *# Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Recognize personal and industry safety requirements.
02.0 Verify the proper use and care of basic shop tools and equipment.
03.0 Outline the appropriate set-up procedures.
04.0 Show proficiency in performing routine preventative maintenance services.
05.0 Compare and contrast the differences in the measurement systems, fasteners and thread repair.
06.0 Illustrate industry-related math skills.
07.0 Show proficiency in parts inventory identification and repair order processing.
08.0 Perform basic services and minor repairs.
09.0 Perform basic frame and suspension service.
10.0 Perform basic electrical system service.
11.0 Diagnose, service and repair cooling systems.
12.0 Diagnose, repair and recondition basic engine components.
13.0 Apply industry-related science to motorcycle service.
14.0 Diagnose, service and repair frames and suspension components.
15.0 Diagnose, service and repair wheels, tires, and brakes.
16.0 Diagnose, service and repair drive trains.
17.0 Diagnose, service and repair fuel and exhaust systems.

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 1**
Course Number: **8766110**
Course Credit: **1**

Course Description:
The Motorcycle Service 1 course prepares students for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study safety requirements, tools and equipment, set-up procedures, and routine preventative maintenance.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Recognize personal and industry safety requirements.-The student will be able to:		
01.01	List the federal and state standards for health and safety, including OSHA and the Federal Law as recorded in (29 CFR-1910.1200).		
01.02	Outline the safety requirements for shop organization and management.		
01.03	Recognize the safety requirements for the use of industry tools and equipment.		
01.04	List the fire-safety precautions.		
01.05	Recognize electrical-safety precautions.		
02.0	Verify the proper use and care of basic shop tools and equipment.-The student will be able to:		
02.01	Categorize general and specialized hand tools.		
02.02	Examine and use power tools.		
02.03	Classify and use fasteners.		
02.04	Document proper use of air tools.		
02.05	Utilize oxy-acetylene welding outfit for heating, welding, brazing and cutting.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	02.06 Use heating devices to perform service procedures.		
03.0	Outline the appropriate set-up procedures.-The student will be able to:		
	03.01 Inspect and interpret vehicle identification number information.		
	03.02 Inspect tires; check and adjust air pressure.		
	03.03 Check for proper fluid levels.		
	03.04 Utilize electrical test equipment to isolate defective components and check lamp circuits.		
	03.05 Inspect and fill battery.		
	03.06 Clean engine.		
	03.07 Install cables, hoses and electrical assemblies.		
	03.08 Inspect cables, connectors, clamps and hold-downs; adjust as necessary.		
	03.09 Read and interpret a wiring diagram.		
	03.10 Troubleshoot and repair wiring harnesses.		
04.0	Show proficiency in performing routine preventative maintenance services.-The student will be able to:		
	04.01 Compare and contrast typical motorcycle lubricants and lubricant properties.		
	04.02 Inspect and test head and tail lamp circuits; aim headlights and replace bulbs.		
	04.03 Inspect battery terminals and the state-of-charge test; perform slow/fast battery charge.		
	04.04 Inspect and clean battery cables, connectors, clamps and hold-downs; repair or replace as needed.		
	04.05 Inspect and test fusible links, circuit breakers and fuses; replace as needed.		
	04.06 Check radiator coolant level (if applicable), test and add coolant.		
	04.07 Check fluid levels and change fluids and the tightness of the oil filters.		

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 2**
Course Number: **8766120**
Course Credit: **1**

Course Description:
The Motorcycle Service 2 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study measurement systems, fasteners, thread repair, and math.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.0	Compare and contrast the differences in the measurement systems, fasteners and thread repair.-The student will be able to:		
05.01	Describe and distinguish the different types of measurement systems.		
05.02	Compare and contrast the different types of fasteners.		
05.03	Explain the steps of inspecting, cleaning and replacement of broken fasteners.		
05.04	Describe the sequence of tightening and torqueing fasteners to specs.		
05.05	Compare and contrast the different stress fractures of fasteners		
06.0	Illustrate industry-related math skills.-The student will be able to:		
06.01	Measure tolerance(s) using millimeters and inches.		
06.02	Perform metric to SAE (and SAE to metric) conversions.		
06.03	Perform correct measurements using different precise metering tools. T handle measuring tool.		
06.04	Perform correct measures using Vernier Calipers.		
06.05	Perform correct measures using Micrometers.		

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 3**
Course Number: **8766130**
Course Credit: **1**

Course Description:
The Motorcycle Service 3 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1 & 2 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study parts inventory, repair ordering, basic services and minor repairs, basic frame, and suspension.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
07.0	Show proficiency in parts inventory identification and repair order processing.-The student will be able to:		
07.01	Read and interpret information in parts and service manuals and other technical media.		
07.02	Read and understand graphs, charts, diagrams and tables commonly used in the industry.		
07.03	Write and process work orders.		
07.04	Prepare cost estimates for jobs using service and flat-rate standards.		
07.05	Perform basic parts inventory tracking with the latest computer updates.		
07.06	Interpret and verify complaint; determine needed repairs. If find more than first estimated ask customer if ok to do repairs.		
08.0	Perform basic services and minor repairs.-The student will be able to:		
08.01	Identify, select and use appropriate replacement parts.		
08.02	Clean or replace after inspection of air filtration.		
08.03	Service and check batteries, if not charging then replace.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.04 Service lubrication systems.		
08.05 Name the components of air and liquid cooling systems by name and function.		
08.06 Remove, remount and balance tires.		
08.07 Diagnose, service and repair chain and belt final drive components.		
09.0 Perform basic frame and suspension service.-The student will be able to:		
09.01 Categorize the different front- and rear-suspension systems and explain their operation.		
09.02 Compare the parts and functions of different frames and suspension systems.		
09.03 Explain how wheels, tires and suspension affect chassis performance and ride-ability.		
09.04 Replace and true a wheel assembly.		
09.05 Diagnose and service wheel bearings and seals.		

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 4**
Course Number: **8766140**
Course Credit: **1**

Course Description:
The Motorcycle Service 4 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1, 2 & 3 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study electrical system services.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Perform basic electrical system service.-The student will be able to:		
10.01 Assess and use basic electrical system test equipment.		
10.02 Use basic DC electrical theory to select appropriate test procedures.		
10.03 Inspect and test fusible links, circuit breakers and fuses; replace as needed.		
10.04 Check electrical circuits with a test light; determine needed repairs.		
10.05 Troubleshoot and repair battery-operated electronic ignition systems.		
10.06 Troubleshoot and repair magneto-ignition systems.		
10.07 Troubleshoot and repair capacitive-discharge-ignition (CDI) systems.		
10.08 Troubleshoot and repair half-wave and full-wave charging systems.		
10.09 Troubleshoot and repair three-phase charging systems.		
10.10 Troubleshoot and repair electrical starter systems.		
10.11 Troubleshoot and repair Direct-Current (DC) Generators.		
10.12 Troubleshoot and repair Warning systems.		

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 5**
Course Number: **8766150**
Course Credit: **1**

Course Description:
The Motorcycle Service 5 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1, 2, 3 & 4 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study diagnostics, service, and repair of cooling systems, and engine components.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.0 Diagnose, service, and repair cooling systems.-The student will be able to:		
11.01 Categorize the components of air and liquid cooling systems by name and function.		
11.02 Diagnose service and repair air-cooling systems.		
11.03 Diagnose service and repair liquid cooling systems.		
12.0 Diagnose, repair and recondition basic engine components.-The student will be able to:		
12.01 Explain the engine operating theory.		
12.02 Recondition a two-stroke engine top-end.		
12.03 Recondition a single-cylinder four-stroke engine top-end.		
12.04 Recondition a multi-cylinder four-stroke engine top-end.		
12.05 Rebuild a four-stroke head.		
12.06 Recondition a single-cylinder four-stroke engine bottom-end.		
12.07 Recondition a multi-cylinder four-stroke engine bottom-end.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.08 Recondition a two-stroke engine bottom-end.		
12.09 Service a plain-bearing crankshaft.		
12.10 Diagnose and repair oil-delivery systems.		

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Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 6**
Course Number: **8766160**
Course Credit: **1**

Course Description:
The Motorcycle Service 6 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1, 2, 3, 4, & 5 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study the science of motorcycles, frames, and suspension systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.0 Apply industry-related science to motorcycle service.-The student will be able to:		
13.01 Explain how temperature extremes, chemical reactions and moisture content affect motorcycle systems.		
13.02 Draw conclusions or make inferences from data.		
14.0 Diagnose, service, and repair frames and suspension components.-The student will be able to:		
14.01 Service and repair front suspension.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.02 Service and repair rear suspension.		
14.03 Inspect, remove, and replace frames.		

2019 - 2020

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 7**
Course Number: **8766170**
Course Credit: **1**

Course Description:
The Motorcycle Service 7 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1, 2, 3, 4, 5, & 6 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study wheels, tires, and brakes.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Diagnose, service, and repair wheels, tires and brakes.-The student will be able to:		
15.01 Diagnose and repair mechanical disc and drum brake systems and components.		
15.02 Diagnose and repair hydraulic disc and drum brake systems and components.		
15.03 Diagnose and repair ABS braking systems and other advanced stopping systems.		

Florida Department of Education
Student Performance Standards

Course Title: **Motorcycle Service 8**
Course Number: **8766180**
Course Credit: **1**

Course Description:
The Motorcycle Service 8 course is designed to build on the skills and knowledge students learned in Motorcycle Service 1, 2, 3, 4, 5, 6, & 7 for entry into the motorcycle service industry. Students explore career opportunities and requirements of a professional motorcycle mechanic. Students study drive trains, fuel, and exhaust systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.0	Diagnose, service, and repair drive trains.-The student will be able to:		
16.01	Diagnose, service, and repair primary-drive systems.		
16.02	Diagnose, service, and repair clutch assemblies.		
16.03	Diagnose, service, and repair transmissions.		
16.04	Diagnose, service, and repair shaft drives.		
16.05	Diagnose and repair kick-start systems.		
17.0	Diagnose, service, and repair fuel and exhaust systems.-The student will be able to:		
17.01	Identify components and operation of carburetion and fuel-injection systems.		
17.02	Diagnose service and repair slide-type carburetors.		
17.03	Diagnose service and repair constant-velocity-type (CV-type) carburetors.		
17.04	Diagnose service and repair fixed Venturi carburetors.		
17.05	Diagnose service and repair fuel-injection systems.		
17.06	Diagnose service and repair exhaust systems replace necessary components as needed.		
17.07	Diagnose service and repair other fuel-delivery-system components.		

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)

SkillsUSA is the intercurricular career and technical student organization 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.

Cooperative Training – OJT

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

Accommodations

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

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

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified

for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Maintenance General**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9540600
CIP Number	0647060702
Grade Level	9 – 12
Standard Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3011 – Aircraft Mechanics and Service Technicians

Purpose

The purpose of this program is to prepare students for employment or advanced training in the commercial and general aviation industry. Instruction is designed to prepare students for Federal Aviation Administration (FAA) license examinations for Airframe ratings. Federal Aviation Regulation (FAR) Part 147 identifies minimum requirements for AMT schools. Any changes to the FAA-approved course content must be approved in advance. This program prepares students for employment as an Aviation General Maintenance Technician Helper, and an Aviation Maintenance Technician with FAA Airframe Rating.

This program focuses on broad, transferable skills, stresses understanding of all aspects of the aviation maintenance industry, and demonstrates elements of the industry such as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

The following table illustrates the Secondary program structure:

Aviation Maintenance General – 3 secondary credits (FAA required). These courses may be used as part of "Aviation Powerplant Mechanics" or "Aviation Airframe Mechanics".

The FAA required subject matter may be sequenced in Aviation Maintenance General 1 through 3 as necessary to meet program specific General requirements. The student will be provided with a transcript of the FAA completed requirements when he or she leaves/moves as proof of completion/competency. The total FAA approved General program may not extend beyond the number courses for the high school program.

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9540610	Private Pilot Ground School	AIR MECH @7 7G AVIONICS @7 7G AEROSPACE 7G ENG TEC 7G TEC ED 1@2	1 credit	49-3011	3	
B	8715110	Aviation Maintenance General 1	AIR MECH @7 7G	1 credit	49-3011	3	
	8715120	Aviation Maintenance General 2		1 credit		3	
	8715130	Aviation Maintenance General 3		1 credit		3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9540610	**	**	**	**	**	**	**	**	**	**	**
8715110	**	**	**	**	**	**	**	**	**	**	**
8715120	**	**	**	**	**	**	**	**	**	**	**
8715130	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9540610	**	**	**	**	**	**	**
8715110	**	**	**	**	**	**	**
8715120	**	**	**	**	**	**	**
8715130	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate an understanding of safe and effective work practices.
02.0 Demonstrate an understanding of fundamentals of flight.
03.0 Understand and explain Federal Aviation Administration Regulations.
04.0 Demonstrate understanding of meteorology.
05.0 Demonstrate knowledge of aircraft communication equipment.
06.0 Demonstrate knowledge and understanding of aircraft propulsion and associated systems.
07.0 Demonstrate an understanding of navigation systems and procedures.
08.0 Demonstrate flight planning skills.
09.0 Demonstrate effective communication skills.
10.0 Demonstrate analytical skills.
11.0 Demonstrate understanding of applied sciences.
12.0 Describe human factors related to safe aircraft operation.
13.0 Describe the Flight Training process.
14.0 Describe Aircraft Safety of Flight Principles.
15.0 Describe the Airport Environment.
16.0 Perform basic aircraft drawing skills.
17.0 Demonstrate aircraft weight and balance skills.
18.0 Perform ground operations and servicing duties.
19.0 Demonstrate mathematical skills.
20.0 Maintain forms and records.
21.0 Apply principles of basic physics.
22.0 Demonstrate the use of maintenance publications.
23.0 Demonstrate appropriate communication skills.
24.0 Demonstrate employability skills as an Aviation Maintenance General Technician.
25.0 Maintain aircraft fluid lines and fittings.
26.0 Perform aircraft materials and processes skills.
27.0 Perform cleaning and corrosion-control operations.
28.0 Perform basic electricity skills.
29.0 Interpret mechanic privileges and limitations.

Florida Department of Education
Student Performance Standards

Course Title: **Private Pilot Ground School**
Course Number: **9540610**
Course Credit: **1**

Course Description:
The Private Pilot Ground School course prepares students for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation pilot/mechanic. Students study general shop safety, fundamentals of flight, FAA regulations, meteorology, aircraft communications, propulsion, and navigation systems, flight planning, communication and analytical skills, applied sciences, safe aircraft operation and principles, flight training processes, and airport environments.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA
01.0	Demonstrate an understanding of safe and effective work practices.-The student will be able to:			
01.01	Demonstrate an awareness and understanding of fueling operations.			
01.02	Demonstrate an understanding of situational awareness.			
01.03	Demonstrate an awareness and understanding of fire hazards, and how to control and extinguish fires.			
01.04	Demonstrate an awareness and understanding for the need of safety devices, controls, guards and equipment.			
02.0	Demonstrate an understanding of fundamentals of flight.-The student will be able to:			
02.01	Name and compare the four forces of flight.			
02.02	Describe the structural components of an aircraft.			
02.03	Describe airfoil design factors.			
02.04	Explain how an airfoil produces lift using Bernoulli's principles and Newton's Laws of Force and Motion			
02.05	Discuss how and why an airplane stalls and spins.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA
02.06	Describe the function of aircraft flight controls and their effect on aircraft pitch, roll, and yaw			
02.07	Describe and explain the operation and use of pitot/static, vacuum/gyroscopic, pressure and engine instruments.			
02.08	Explain factors affecting aircraft design, performance, and operation.			
03.0	Understand and explain Federal Aviation Administration Regulations.-The student will be able to:			
03.01	Explain major portion of Parts 1, 61, 91, 135, 141 and NTSB 830 of the Federal Aviation Regulations.			
04.0	Demonstrate understanding of meteorology.-The student will be able to:			
04.01	Describe the composition, circulation and stability of the atmosphere.			
04.02	Demonstrate an understanding of air mass development, the movement of fronts and their effect on aviation.			
04.03	Demonstrate an awareness of weather hazards to aviation and an understanding of how to avoid them.			
04.04	Demonstrate the ability to access weather information prior to and during flights through a variety of media.			
04.05	Interpret printed reports, forecasts and graphic weather products.			
05.0	Demonstrate knowledge of aircraft communication equipment.-The student will be able to:			
05.01	Use and explain aircraft voice communication equipment.			
05.02	Explain function and use of ELT's, voice recorders, and other emergency communication systems.			
05.03	Demonstrate use of proper phraseology in ATC communications.			
05.04	Discuss uses and limitations of portable transceivers.			
05.05	Demonstrate use of phonetic alphabet.			
06.0	Demonstrate knowledge and understanding of aircraft propulsion and associated systems.-The student will be able to:			
06.01	Describe and identify reciprocating and turbine engine components.			
06.02	Compare the merits of fixed and variable pitch propellers.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA
06.03	Describe a typical lubrication system.			
06.04	Describe a typical aircraft electrical system, including a magneto ignition systems and proper magneto checks.			
06.05	Describe the difference between a normally aspirated engine and one that is supercharged or turbocharged.			
06.06	Describe the difference between gravity fed and pump fed fuel systems.			
06.07	Demonstrate basic operation of an aircraft engine, including proper interpretation of instruments and use of appropriate engine controls.			
07.0	Demonstrate an understanding of navigation systems and procedures.-The student will be able to:			
07.01	Distinguish between latitude and longitude.			
07.02	Define radio navigation.			
07.03	Explain the operation of the magnetic compass, including compass errors.			
07.04	Describe and demonstrate use of VOR equipment and navigation.			
07.05	Describe the operation of GPS navigation equipment.			
07.06	Explain DME principles.			
07.07	Explain sectional charts and their use.			
07.08	Explain lost communications emergency procedures under VFR.			
07.09	Plot and explain a route of flight.			
07.10	Differentiate different classes of airspace and usage within the FAA national airspace system.			
08.0	Demonstrate flight planning skills.-The student will be able to:			
08.01	Explain major portions of Parts 1, 91 and NTSB 830 of the Federal Aviation Rules and Regulations.			
08.02	Define weight and balance.			
08.03	Define center of gravity, moment, datum line, CG envelope, basic empty weight, and gross weight.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA
08.04	Calculate, compute, and solve given weight and balance problems.			
08.05	Demonstrate acquisition of appropriate weather data.			
08.06	Demonstrate proper selection of destination/enroute/alternate airports.			
08.07	Explain fuel requirements.			
08.08	Read and interpret performance charts to predict aircraft performance.			
08.09	Demonstrate the use of a flight computer.			
08.10	Access and analyze NOTAMS.			
08.11	Define and describe the various phases of flight.			
08.12	Explain the function of a pilot logbook.			
08.13	Prepare a VFR flight plan.			
08.14	Demonstrate familiarity with various published sources of flight information (Airfield Directories, NOTAMS, Aeronautical Information Manual, and Advisory Circulars).			
09.0	Demonstrate effective communication skills.-The student will be able to:			
09.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.			
09.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.			
09.03	Read and follow written and oral English instructions.			
09.04	Answer and ask questions coherently and concisely.			
09.05	Demonstrate telephone/communication skills.			
09.06	Demonstrate knowledge and use of appropriate computer skills.			
09.07	Demonstrate interpersonal skills.			
10.0	Demonstrate analytical skills.-The student will be able to:			
10.01	Add, subtract, multiply and divide using fractions, decimals, whole numbers, percentages, and ratios.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA
	10.02 Demonstrate understanding and use of the metric system.			
11.0	Demonstrate understanding of applied sciences.-The student will be able to:			
	11.01 Draw conclusions or make inferences from data.			
	11.02 Understand pressure measurement in terms of P.S.I., inches of mercury, and metric.			
12.0	Describe human factors related to safe aircraft operation.-The student will be able to:			
	12.01 Describe effects of the flight environment on human physiology			
	12.02 Describe the effects of alcohol and drugs on human performance.			
	12.03 Explain Crew Resource Management (CRM).			
	12.04 Describe situational awareness (SA).			
	12.05 Describe Aeronautical Decision Making (ADM) skills.			
13.0	Describe the Flight Training process.-The student will be able to:			
	13.01 Define various pilot certificates and ratings (private, instrument, multi-engine, commercial, certified flight instructor (CFI/CFII/MEI), and airline transport pilot (ATP).			
	13.02 List and describe both professional and non-professional aviation opportunities.			
14.0	Describe Aircraft Safety of Flight Principles.-The student will be able to:			
	14.01 Summarize techniques of collision avoidance, including proper visual scanning and right of way rules.			
	14.02 Describe minimum safe altitude (MSA) and preparation for flight over hazardous terrain.			
	14.03 Describe proper ground taxi techniques.			
	14.04 Summarize the airport traffic pattern (entry, altitudes, turns, legs, and departure).			
15.0	Describe the Airport Environment.-The student will be able to:			
	15.01 Describe the configuration of airports, including runways taxiways markings and signs.			
	15.02 Describe airport lighting (runways, taxiways, beacons, and			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	FAA
approach lighting systems).			

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Florida Department of Education
Student Performance Standards

Course Title: **Aviation Maintenance General 1**
Course Number: **8715110**
Course Credit: **1**

Course Description:
The Aviation Maintenance General 1 course prepares students for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation mechanic. Students study general hangar and shop safety, environmental concerns, mathematics, physics, basic aerodynamics, federal aviation regulations, publications and records.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	FAA FAR Part 147
16.0 Perform basic aircraft drawing skills.-The student will be able to:			
16.01 Use aircraft drawings, symbols, and system schematics.			App. B, B, 7. Level 2
16.02 Draw sketches of repairs and alterations.			App. B, B, 8. Level 3
16.03 Use blueprint information.			App. B, B, 9. Level 3
16.04 Use graphs and charts.			App. B, B, 10. Level 3

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
17.0	Demonstrate aircraft weight and balance skills.-The student will be able to:			
17.01	Weigh aircraft.			App. B, C, 11. Level 2
17.02	Perform complete weight-and-balance check and record data.			App. B, C, 12. Level 3
17.03	Properly configure aircraft for weighing and capable of setting up and using weighing equipment.			
18.0	Perform ground operations and servicing duties.-The student will be able to:			
18.01	Start, ground-operate, move, service, and secure aircraft and identify typical ground-operations hazards.			App. B, G, 20. Level 2
18.02	Identify and select fuels.			App. B, G, 21. Level 2
18.03	Comply with prescribed shop and personal safety procedures.			
19.0	Demonstrate mathematical skills.-The student will be able to:			
19.01	Determine areas and volumes of various geometrical shapes by solving problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.			App. B, H, 25. Level 3
19.02	Solve ratio, proportion, and percentage problems.			App. B, H, 26. Level 3
19.03	Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.			App. B, H, 27. Level 3
20.0	Maintain forms and records.-The student will be able to:			
20.01	Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.			App. B, I, 28. Level 3
20.02	Complete required maintenance forms, records, and inspection reports.			App. B, I, 29. Level 3
21.0	Apply principles of basic physics.-The student will be able to:			
21.01	Use and understand the principles of simple machines; sound, fluid, and heat dynamics; basic aerodynamics; aircraft structures; and theory of flight.			App. B, J, 30. Level 2
21.02	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials and know the proper precautions required for handling such materials.			
21.03	Understand pressure measurement in terms of PSI, inches of mercury, and KPA.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
22.0	Demonstrate the use of maintenance publications.-The student will be able to:			
22.01	Demonstrate ability to read, comprehend, and apply information contained in FAA and manufacturers' aircraft maintenance specifications, data sheets, manuals, publications, and related Federal Aviation Regulations, Airworthiness Directives, and Advisory material.			App. B, K, 31. Level 3
22.02	Read technical data.			App. B, K, 32. Level 3
23.0	Demonstrate appropriate communication skills.-The student will be able to:			
23.01	Read and follow written and oral instructions.			
23.02	Answer and ask questions coherently and concisely.			
24.0	Demonstrate employability skills as an Aviation General Maintenance Technician.-The student will be able to:			
24.01	Identify appropriate responses to criticism from employer, supervisor, or other employees.			
24.02	Identify work habits for getting and keeping a job.			
24.03	Explain the purpose of the Federal Law as recorded in (29 CFR-1910.1200).			

Florida Department of Education
Student Performance Standards

Course Title: **Aviation Maintenance General 2**
Course Number: **8715120**
Course Credit: **1**

Course Description:
The Aviation Maintenance General 2 course is designed to build on the skills and knowledge students learned in Aviation Maintenance General 1 for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation mechanic. Students study aircraft hardware and precision measuring instruments; blueprints and drawings; hand and power tools; and fluid lines and fittings.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
19.0	Demonstrate mathematical skills.-The student will be able to:			
19.01	Determine areas and volumes of various geometrical shapes by solving problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.			App. B, H, 25. Level 3
20.0	Maintain forms and records.-The student will be able to:			
20.01	Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.			App. B, I, 28. Level 3
20.02	Complete required maintenance forms, records, and inspection reports.			App. B, I, 29. Level 3
21.0	Apply principles of basic physics.-The student will be able to:			
21.01	Use and understand the principles of simple machines; sound, fluid, and heat dynamics; basic aerodynamics; aircraft structures; and theory of flight.			App. B, J, 30. Level 2
21.02	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
	21.03 Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials and know the proper precautions required for handling such materials.			
22.0	Demonstrate the use of maintenance publications.-The student will be able to:			
	22.01 Demonstrate ability to read, comprehend, and apply information contained in FAA and manufacturers' aircraft maintenance specifications, data sheets, manuals, publications, and related Federal Aviation Regulations, Airworthiness Directives, and Advisory material.			App. B, K, 31. Level 3
	22.02 Use technical data to perform required tasks.			
23.0	Demonstrate appropriate communication skills.-The student will be able to:			
	23.01 Write logical and understandable statements or phrases to accurately complete forms/invoices commonly used in business and industry.			
	23.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.			
24.0	Demonstrate employability skills as an Aviation Maintenance General Technician.-The student will be able to:			
	24.01 Identify documents that may be required when applying for a job position.			
	24.02 Identify appropriate responses to criticism from employer, supervisor, or other employees.			
25.0	Maintain aircraft fluid lines and fittings.-The student will be able to:			
	25.01 Fabricate and install rigid and flexible fluid lines and fittings.			App. B, D, 13. Level 3
	25.02 Utilize proper personal safety procedures for fluid lines and fittings.			
26.0	Perform aircraft materials and processes skills.-The student will be able to:			
	26.01 Identify and select appropriate nondestructive testing methods.			App. B, E, 14. Level 1
	26.02 Perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections.			App. B, E, 15. Level 2
	26.03 Perform basic heat-testing processes.			App. B, E, 16. Level 1
	26.04 Identify and select aircraft hardware and materials.			App. B, E, 17. Level 3

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
26.05	Inspect and check welds.			App. B, E, 18. Level 3
26.06	Perform precision measurements.			App. B, E, 19. Level 3
26.07	Perform safety-wiring techniques.			
27.0	Perform cleaning and corrosion-control operations.-The student will be able to:			
27.01	Identify and select cleaning materials.			App. B, G, 22. Level 3
27.02	Inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning. Understand metal strength limitations when removing corrosion.			App. B, G, 23. Level 3

Florida Department of Education
Student Performance Standards

Course Title: **Aviation Maintenance General 3**
Course Number: **8715130**
Course Credit: **1**

Course Description:
The Aviation Maintenance General 3 course is designed to build on the skills and knowledge students learned in Aviation Maintenance General 1 & 2 for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation mechanic. Students study basic electricity and DC electrical circuits; aircraft battery service and inspection; AC electrical circuits and solid-state circuits.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
19.0	Demonstrate mathematical skills.-The student will be able to:			
19.01	Determine areas and volumes of various geometrical shapes by solving problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.			App. B, H, 25. Level 3
19.02	Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.			App. B, H, 27. Level 3
19.03	Extract roots and raise numbers to a given power.			App. B, H, 24. Level 3
20.0	Maintain forms and records.-The student will be able to:			
20.01	Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.			App. B, I, 28. Level 3
20.02	Complete required maintenance forms, records, and inspection reports.			App. B, I, 29. Level 3
21.0	Apply principles of basic physics.-The student will be able to:			
21.01	Use and understand the principles of simple machines; sound, fluid, and heat dynamics; basic aerodynamics; aircraft structures; and theory of flight.			App. B, J, 30. Level 2
21.02	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials and know the proper precautions required for handling such materials.			
22.0	Demonstrate the use of maintenance publications.-The student will be able to:			
22.01	Demonstrate ability to read, comprehend, and apply information contained in FAA and manufacturers' aircraft maintenance specifications, data sheets, manuals, publications, and related Federal Aviation Regulations, Airworthiness Directives, and Advisory material.			App. B, K, 31. Level 3
22.02	Use technical data to perform required tasks			
23.0	Demonstrate appropriate communication skills.-The student will be able to:			
23.01	Read critically by recognizing assumptions and implications and by evaluating ideas.			
24.0	Demonstrate employability skills as an Aviation Maintenance General Technician.-The student will be able to:			
24.01	Conduct a job search.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	FAA FAR Part 147
24.02	Secure information about a job.			
24.03	Complete a job-application form correctly.			
24.04	Demonstrate job-interview skills.			
24.05	Explain how to make job changes.			
28.0	Perform basic electricity skills.-The student will be able to:			
28.01	Calculate and measure capacitance and inductance.			App. B, A, 1. Level 2
28.02	Calculate and measure electrical power.			App. B, A, 2. Level 2
28.03	Measure voltage, current, resistance, and continuity.			App. B, A, 3. Level 3
28.04	Determine the relationship of voltage, current, and resistance in electrical circuits.			App. B, A, 4. Level 3
28.05	Read and interpret aircraft electrical-circuit diagrams, including solid-state devices and logic functions.			App. B, A, 5. Level 3
28.06	Inspect and service batteries.			App. B, A, 6. Level 3
28.07	Utilize proper electrical safety procedures.			
29.0	Interpret mechanic privileges and limitations.-The student will be able to:			
29.01	Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.			App. B, L, 33. Level 3
29.02	Identify the information in Federal Aviation Regulations (FAR) Part 65 pertaining to eligibility for Aviation Maintenance Technician (AMT) certification and ratings.			
29.03	Identify the FAA requirements that must be satisfied in order to display the FAA Airframe and Power-Plant license.			

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.

Classroom, shop, and laboratory activities are an integral part of this program. FAR Section 147.21(e) requires teaching of at least 50 percent of the curriculum in the shop or laboratory. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes found in the industry. Equipment and supplies should be provided to enhance hands-on experiences for students in the chosen occupation.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization 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.

Special Notes

Required FAA exams include GENERAL written, oral, and practical. The only way a person can get authorization to take this examination is to: (1) graduate from an approved school or (2) obtain permission from the FAA to take the test based on prior experience on certified aircraft. Schools cannot grant permission (FAA FAR, Part 65 and Part 147, Subpart C 147.31).

Since an Aviation Maintenance Technician School (AMTS) is certified and inspected by the FAA, satisfaction of FAR Part 147 requirements should be the primary concern of an AMTS. When local and state educational requirements conflict with the FAA's regulation of an AMTS, those requirements must be resolved to satisfy FAR Part 147. In other words, FAA standards take precedence over other requirements. The FAA specifies minimum hours required and encourages schools to exceed minimum standards for the curriculum. The course content specified by the FAA may not be lowered.

"FAA FAR Part 147" identifies standards required by the FAA. Minimum teaching levels expected by the FAA also appear:

Level 1: knowledge of general principles
Level 2: knowledge of general principles and limited practical application
Level 3: knowledge of general principles with a high degree of practical application and hands-on skill levels according to FAA FAR Part 147: For subjects taught at Level 3, all special tools required to meet “return to service” standards must be in satisfactory working condition, properly calibrated/tested, and of the proper kind for the purpose for which they are intended. Tools should include an adequate supply of special tools appropriate to the ratings and curriculum. If students are required to provide hand tools, then the school should list the specific tools with the curriculum and provide a copy of this list to the students. Shop equipment and special tools should be maintained in good working order and be in a condition for safe operation.

All tools and equipment should be maintained in good working order and be in a condition for safe operation. The types of tools and equipment required for Aviation General, Airframe, and Powerplant teaching include the ones listed below:

> Common hand tools, portable tools, precision tools, machine tools, torqueing tools, shop equipment and machinery, specialized tools and equipment, airframe structures, aircraft, airframes, powerplants, propellers, and components of this equipment

FAA FAR Part 147 states: Each certified Aviation Maintenance Technician School shall provide facilities, equipment, and material equal to the standards currently required for the issue of the certificate and rating that it holds.

Refer to FAA FAR Part 147 and industry publications for more information about required levels of proficiency, hours of instruction, and updates to occupational titles and training requirements. Keeping pace with the standards of industry and maintaining a high quality of training requires ongoing linkages with industry and FAA representatives.

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.

Cooperative Training – OJT

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

Accommodations

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

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

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

Florida Department of Education
Curriculum Framework

Program Title: **Aviation Assembly and Fabrication**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Secondary – Career Preparatory	
Program Number	9540700
CIP Number	0647060907
Grade Level	9 – 12
Standard Length	4 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3011 – Aircraft Mechanics and Service Technicians 51-2011 – Aircraft Structure, Surfaces, Rigging, and Systems Assemblers

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes, but is not limited to understanding the foundational skills necessary for working in the aviation assembly and fabrication industries. Knowledge of the Federal Aviation Administration (FAA), aviation history and innovations, tools and materials, quality control, aircraft manufacturing processes, and mathematical practices related to the assembly and fabrication of aircraft will be expected.

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

Program Structure

This program is a planned sequence of instruction consisting of two occupational completion points.

The following table illustrates the Secondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
A	9540610	Private Pilot Ground School	AIR MECH @7 7G AVIONICS @7 7G AEROSPACE 7G	1 credit	49-3011	3	
	9540710	Aviation Assembly Technician 1	ENG TEC 7G	1 credit		3	
	9540720	Aviation Assembly Technician 2	TEC ED 1@2	1 credit		3	
B	9540730	Aviation Assembly Technician 3	ENG&TEC ED1@2	1 credit	51-2011	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

Academic Alignment Table

Academic alignment is an ongoing, collaborative effort of professional educators specializing in the fields of science, mathematics, English/language arts, and Career and Technical Education (CTE). This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses. Career and Technical Education courses that have been aligned to the Next Generation Sunshine State Standards for Science and the Florida Standards for Mathematics and English/Language Arts will show the following data: the quantity of academic standards in the CTE course; the total number of standards contained in the academic course; and the percentage of alignment to the CTE course.

Courses	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Environmental Science	Genetics	Integrated Science	Marine Science 1 Honors	Physical Science	Physics 1
9540610	**	**	**	**	**	**	**	**	**	**	**
9540710	**	**	**	**	**	**	**	**	**	**	**
9540720	**	**	**	**	**	**	**	**	**	**	**
9540730	**	**	**	**	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Courses	Algebra 1	Algebra 2	Geometry	English 1	English 2	English 3	English 4
9540610	**	**	**	**	**	**	**
9540710	**	**	**	**	**	**	**
9540720	**	**	**	**	**	**	**
9540730	**	**	**	**	**	**	**

** *Alignment pending review* # *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. The FS for Mathematical Practices are designed for grades K-12 and describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Instructors must incorporate the Florida Standards for Technical Subjects and Mathematical Practices throughout instruction of this CTE program.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

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

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 Demonstrate an understanding of safe and effective work practices.
02.0 Demonstrate an understanding of fundamentals of flight.
03.0 Understand and explain federal aviation administration regulations.
04.0 Demonstrate understanding of meteorology.
05.0 Demonstrate knowledge of aircraft communication equipment.
06.0 Demonstrate knowledge and understanding of aircraft propulsion and associated systems.
07.0 Demonstrate an understanding of navigation systems and procedures.
08.0 Demonstrate flight planning skills.
09.0 Demonstrate effective communication skills.
10.0 Demonstrate analytical skills.
11.0 Demonstrate understanding of applied sciences.
12.0 Describe human factors related to safe aircraft operation.
13.0 Describe the flight training process.
14.0 Describe aircraft safety of flight principles.
15.0 Describe the airport environment.
16.0 Demonstrate an understanding of the influence of technology on aviation history.
17.0 Describe and demonstrate an understanding of the principles of flight.
18.0 Demonstrate knowledge of mathematics for aviation.
19.0 Use appropriate aviation publications on maintenance forms and records to FAA.
20.0 Demonstrate a basic knowledge of aircraft structures and terminology.
21.0 Demonstrate knowledge and understanding of safety practices in the aviation environment.
22.0 Demonstrate abilities to apply the design process.
23.0 Demonstrate the proper use and maintenance of aviation tools.
24.0 Demonstrate appropriate understanding of basic aviation science.
25.0 Demonstrate appropriate understanding of basic aviation corrosion control.
26.0 Prepare, analyze, and evaluate technical reports and data.
27.0 Select, configure, calibrate, operate and evaluate precision test equipment.
28.0 Demonstrate knowledge and understanding of basic electricity and electronics.
29.0 Demonstrate a basic knowledge of structural assembly – metallic / composite.
30.0 Demonstrate the knowledge of quality control and the impact of products and systems.
31.0 Demonstrate a basic knowledge of wiring and fiber optics installation.
32.0 Demonstrate proper techniques for aviation flightline practices and safety.
33.0 Demonstrate a basic knowledge of allowance / tolerance and tolerance buildups.
34.0 Demonstrate a basic knowledge of hydraulic and pneumatic tubing.
35.0 Demonstrate knowledge of physics and geometry for aviation.
36.0 Demonstrate technical knowledge of computer control as it is related to aviation/aviation projects.
37.0 Demonstrate a basic knowledge of shop practices.
38.0 Demonstrate a basic knowledge of aircraft composite materials.

39.0 Demonstrate a basic knowledge of sheet metal layout, marking, measurements and spacing.
40.0 Demonstrate a basic knowledge of sealants and epoxy.
41.0 Demonstrate an ability to complete a capstone project.

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Florida Department of Education
Student Performance Standards

Course Title: **Private Pilot Ground School**
Course Number: **9540610**
Course Credit: **1**

Course Description:
The Private Pilot Ground School course prepares students for entry into the aviation industry. Students explore career opportunities and requirements of a professional aviation pilot/mechanic. Students study general shop safety, fundamentals of flight, FAA regulations, meteorology, aircraft communications, propulsion, and navigation systems, flight planning, communication and analytical skills, applied sciences, safe aircraft operation's and principles, flight training processes, and airport environments.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.0	Demonstrate an understanding of safe and effective work practices.-The student will be able to:		
01.01	Demonstrate an awareness and understanding of fueling operations.		
01.02	Demonstrate an understanding of situational awareness.		
01.03	Demonstrate an awareness and understanding of fire hazards, and how to control and extinguish fires.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
01.04	Demonstrate an awareness and understanding for the need of safety devices, controls, guards and equipment.		
02.0	Demonstrate an understanding of fundamentals of flight.-The student will be able to:		
02.01	Name and compare the four forces of flight.		
02.02	Describe the structural components of an aircraft.		
02.03	Describe airfoil design factors.		
02.04	Explain how an airfoil produces lift using Bernoulli's principles and Newton's Laws of Force and Motion		
02.05	Discuss how and why an airplane stalls and spins.		
02.06	Describe the function of aircraft flight controls and their effect on aircraft pitch, roll, and yaw		
02.07	Describe and explain the operation and use of pitot/static, vacuum/gyroscopic, pressure and engine instruments.		
02.08	Explain factors affecting aircraft design, performance, and operation.		
03.0	Understand and explain Federal Aviation Administration Regulations.-The student will be able to:		
03.01	Explain major portion of Parts 1, 61, 91, 135, 141 and NTSB 830 of the Federal Aviation Regulations.		
04.0	Demonstrate understanding of meteorology.-The student will be able to:		
04.01	Describe the composition, circulation and stability of the atmosphere.		
04.02	Demonstrate an understanding of air mass development, the movement of fronts and their effect on aviation.		
04.03	Demonstrate an awareness of weather hazards to aviation and an understanding of how to avoid them.		
04.04	Demonstrate the ability to access weather information prior to and during flights through a variety of media.		
04.05	Interpret printed reports, forecasts and graphic weather products.		
05.0	Demonstrate knowledge of aircraft communication equipment.-The student will be able to:		
05.01	Use and explain aircraft voice communication equipment.		
05.02	Explain function and use of ELT's, voice recorders, and other emergency communication systems.		
05.03	Demonstrate use of proper phraseology in ATC communications.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	05.04 Discuss uses and limitations of portable transceivers.		
	05.05 Demonstrate use of phonetic alphabet.		
06.0	Demonstrate knowledge and understanding of aircraft propulsion and associated systems.-The student will be able to:		
	06.01 Describe and identify reciprocating and turbine engine components.		
	06.02 Compare the merits of fixed and variable pitch propellers.		
	06.03 Describe a typical lubrication system.		
	06.04 Describe a typical aircraft electrical system, including a magneto ignition systems and proper magneto checks.		
	06.05 Describe the difference between a normally aspirated engine and one that is supercharged or turbocharged.		
	06.06 Describe the difference between gravity fed and pump fed fuel systems.		
	06.07 Demonstrate basic operation of an aircraft engine, including proper interpretation of instruments and use of appropriate engine controls.		
07.0	Demonstrate an understanding of navigation systems and procedures.-The student will be able to:		
	07.01 Distinguish between latitude and longitude.		
	07.02 Define radio navigation.		
	07.03 Explain the operation of the magnetic compass, including compass errors.		
	07.04 Describe and demonstrate use of VOR equipment and navigation.		
	07.05 Describe the operation of GPS navigation equipment.		
	07.06 Explain DME principles.		
	07.07 Explain sectional charts and their use.		
	07.08 Explain lost communications emergency procedures under VFR.		
	07.09 Plot and explain a route of flight.		
	07.10 Differentiate different classes of airspace and usage within the FAA national airspace system.		
08.0	Demonstrate flight planning skills.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.01	Explain major portions of Parts 1, 91 and NTSB 830 of the Federal Aviation Rules and Regulations.		
08.02	Define weight and balance.		
08.03	Define center of gravity, moment, datum line, CG envelope, basic empty weight, and gross weight.		
08.04	Calculate, compute, and solve given weight and balance problems.		
08.05	Demonstrate acquisition of appropriate weather data.		
08.06	Demonstrate proper selection of destination/enroute/alternate airports.		
08.07	Explain fuel requirements.		
08.08	Read and interpret performance charts to predict aircraft performance.		
08.09	Demonstrate the use of a flight computer.		
08.10	Access and analyze NOTAMS.		
08.11	Define and describe the various phases of flight.		
08.12	Explain the function of a pilot logbook.		
08.13	Prepare a VFR flight plan.		
08.14	Demonstrate familiarity with various published sources of flight information (Airfield Directories, NOTAMS, Aeronautical Information Manual, and Advisory Circulars).		
09.0	Demonstrate effective communication skills.-The student will be able to:		
09.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
09.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
09.03	Read and follow written and oral English instructions.		
09.04	Answer and ask questions coherently and concisely.		
09.05	Demonstrate telephone/communication skills.		
09.06	Demonstrate knowledge and use of appropriate computer skills.		
09.07	Demonstrate interpersonal skills.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.0	Demonstrate analytical skills.-The student will be able to:		
10.01	Add, subtract, multiply and divide using fractions, decimals, whole numbers, percentages, and ratios.		
10.02	Demonstrate understanding and use of the metric system.		
11.0	Demonstrate understanding of applied sciences.-The student will be able to:		
11.01	Draw conclusions or make inferences from data.		
11.02	Understand pressure measurement in terms of P.S.I., inches of mercury, and metric.		
12.0	Describe human factors related to safe aircraft operation.-The student will be able to:		
12.01	Describe effects of the flight environment on human physiology		
12.02	Describe the effects of alcohol and drugs on human performance.		
12.03	Explain Crew Resource Management (CRM).		
12.04	Describe situational awareness (SA).		
12.05	Describe Aeronautical Decision Making (ADM) skills.		
13.0	Describe the flight training process.-The student will be able to:		
13.01	Define various pilot certificates and ratings (private, instrument, multi-engine, commercial, certified flight instructor (CFI/CFII/MEI), and airline transport pilot (ATP).		
13.02	List and describe both professional and non-professional aviation opportunities.		
14.0	Describe aircraft safety of flight principles.-The student will be able to:		
14.01	Summarize techniques of collision avoidance, including proper visual scanning and right of way rules.		
14.02	Describe minimum safe altitude (MSA) and preparation for flight over hazardous terrain.		
14.03	Describe proper ground taxi techniques.		
14.04	Summarize the airport traffic pattern (entry, altitudes, turns, legs, and departure).		
15.0	Describe the airport environment.-The student will be able to:		
15.01	Describe the configuration of airports, including runways taxiways markings and signs.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.02 Describe airport lighting (runways, taxiways, beacons, and approach lighting systems).		

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Florida Department of Education
Student Performance Standards

Course Title: **Aviation Assembly Technician 1**
Course Number: **9540710**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of aviation maintenance & fabrication technology.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Demonstrate an understanding of the influence of technology on aviation history.-The student will be able to:		
16.01 Discuss how the evolution of Aviation has been directly affected by, and has in turn affected, the development.		
16.02 Research the history of Aviation as a powerful force in reshaping the social, cultural, political, and economic landscape.		
16.03 Discuss has aviation has help changed the modern global economy.		
17.0 Describe and demonstrate an understanding of the principles of flight.-The student will be able to:		
17.01 Identify the structural components of aircraft.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	17.02 Discuss the Four Forces of Flight.		
	17.03 Show an example of the Bernoulli's Principle and Subsonic Flow and Lift and Newton's Third Law.		
	17.04 Demonstrate knowledge of Airfoils, Boundary Layer Airflow, Wingtip Vortices, Axes of an Aircraft, Aircraft Stability, Flight Control Surfaces, and High-Speed Aerodynamics.		
	17.05 Explain function of main components of a helicopter, Helicopter Aerodynamics, Helicopter Axes of Flight, and Autorotation.		
18.0	Demonstrate knowledge of mathematics for aviation.-The student will be able to:		
	18.01 Relate knowledge of Whole Numbers, Fractions, Mixed Numbers, Roots, The Decimal Number System, Ratio, Proportion, Percentage, Positive and Negative Numbers, Powers, Functions of Numbers Chart, Scientific Notation to processes in Aviation (Signed Numbers)		
19.0	Use appropriate Aviation publications on maintenance forms and records to FAA.-The student will be able to:		
	19.01 Discuss FAA-FARS, Part 65, AIM, AD's, Aircraft records, and FAA manuals.		
	19.02 Demonstrate knowledge of manufactures Aircraft type specific manuals.		
	19.03 Show the ability to use a Protractor in an aviation activity.		
20.0	Demonstrate a basic knowledge of aircraft structures and terminology.-The student will be able to:		
	20.01 Identify how Major Structural Stresses effect an aircraft.		
	20.02 Describe in writing Fixed-Wing Aircraft Structures.		
	20.03 Describe in writing Helicopter Structures (Minimum Listing)		
21.0	Demonstrate knowledge and understanding of safety practices in the aviation environment.-The student will be able to:		
	21.01 Observe work area rules and regulations.		
	21.02 Identify appropriate emergency procedures.		
	21.03 Describe the requirement to tether tools and personal items.		
	21.04 Describe the process and rationale for logging tools (ingress/egress).		
	21.05 Conduct pre-shift/post-shift tool, materials, equipment, and supplies inventory.		
	21.06 Follow proper foreign object debris (FOD) procedures.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.07	Inspect for FOD. (FOD is anything left anywhere that does not belong in the work area.)		
21.08	Perform good housekeeping practices in the aviation environment.		
21.09	Identify sources of static electricity hazards.		
21.10	Describe appropriate Flight-line fire extinguisher use.		
21.11	Explain the purpose of a safe work zone. Demonstrate the establishment of a safe work zone.		
21.12	Explain the purpose of lock out/tag out requirements.		
21.13	Demonstrate the process of lock out/tag out.		
21.14	Demonstrate the use of appropriate lifting techniques.		
21.15	Show a working knowledge of elementary first aid.		
21.16	Create a book of Safety Data Sheets. (SDS)		
22.0	Demonstrate abilities to apply the design process.-The student will be able to:		
22.01	Interpret a basic drawing/blueprint.		
22.02	Demonstrate how to produce a layout/template.		
22.03	Apply a basic knowledge of Drawing Types (Drawing Titles).		
22.04	Create a drawing of a repair using proper Illustration Methods.		
23.0	Demonstrate the use and maintenance of aviation tools.-The student will be able to:		
23.01	Identify proper tools for task performance.		
23.02	Inspect tools for cleanliness & functionality.		
23.03	Apply proper use and care of precision measuring tools including micrometers, vernier calipers, squares, etc.		
23.04	Demonstrate knowledge and the purpose of precision tool calibration.		
23.05	Demonstrate a basic knowledge Selection of Personal Protective Equipment (PPE).		
23.06	Demonstrate a basic knowledge Tool Use Safety Precaution		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
24.0	Demonstrate appropriate understanding of basic aviation science.-The student will be able to:		
24.01	Identify and characterize unique materials and commodities used in the aviation industry (composites, metals, adhesives, solvents, lubricants, pressurants and propellants).		
24.02	Identify uses and hazards involved in handling common supplies and commodities used in the aviation industry, including compatibility/incompatibility.		
24.03	Complete an activity using chemical processes involved in metal treatments. (i.e., anodizing, cleaning, coating, dipping, lubricants, plating)		
24.04	Identify health-related problems, which may result from exposure to work-related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
24.05	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.		
24.06	Demonstrate knowledge of handling of hypergolics. (hydrazine family, 5606)		
25.0	Demonstrate appropriate understanding of basic aviation corrosion control.-The student will be able to:		
25.01	Distinguish the types of Corrosion and their Causes.		
25.02	Recognize the Effects of Corrosion and its impact on aviation.		
25.03	Identify types of contamination.		
25.04	Explain symptoms and causes of metal fatigue.		
26.0	Prepare, analyze, and evaluate technical reports and data.-The student will be able to:		
26.01	Interpret technical drawings and schematics.		
27.0	Select, configure, calibrate, operate and evaluate precision test equipment.-The student will be able to:		
27.01	Select appropriate test equipment for given test depending on aircraft system equipment.		
28.0	Demonstrate knowledge and understanding of basic electricity and electronics.-The student will be able to:		
28.01	Explain the factors that are special safety considerations when working with electricity.		
28.02	Explain the difference between direct current (DC) and alternating current (AC).		
28.03	Define electric current, voltage, resistance, power, energy, and list the unit of measurement of each.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
29.0	Demonstrate a basic knowledge of structural assembly (metallic/composite).-The student will be able to:		
29.01	Demonstrate a basic knowledge of Drill a Hole to Specification (hole size and depth).		
29.02	Evaluation Cleco's by size and color for proper application.		

Florida Department of Education
Student Performance Standards

Course Title: **Aviation Assembly Technician 2**
Course Number: **9540720**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of aviation maintenance & fabrication technology.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.0	Demonstrate knowledge and understanding of safety practices in the aviation environment.-The student will be able to:		
21.17	Recognize application of safety/OSHA regulations as they apply to aviation.		
21.18	Explain the purpose of catch nets and bags. Demonstrate proper installation procedures. (OSHA 1910 CFR Subpart D, Walking-Working Surfaces)		
21.19	Explain the purpose of and demonstrate the use of the buddy system. (OSHA 1910 CFR Subpart J, Confined space, exposure to hazardous substances, electrical, welding, fall protection)		
21.20	Identify hazardous materials handling. (OSHA 1910 CFR Subpart H, Hazardous Materials)		
22.0	Demonstrate abilities to apply the design process.-The student will be able to:		
22.05	Evaluate criteria and constraints and determine how these will affect the design process.		
22.06	Identify the different elements of an Aircraft Production Drawings as pertaining to aircraft assembly.		
22.07	Draw sketches of repairs and alterations.		
23.0	Demonstrate the proper use and maintenance of aviation tools.-The student will be able to:		
23.07	Identify basic and special aviation hand tools.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	23.08 Operate safely shop machine tools.		
	23.09 Show competency using tool control and management system.		
	23.10 Preform Tool Inspections for Condition and Operation		
	23.11 Complete tool Adjustments in Accordance with Operating Instructions		
24.0	Demonstrate appropriate understanding of basic aviation science.-The student will be able to:		
	24.07 Explain how properties of materials determine their classification and use. (structure, composition, processed state)		
	24.08 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
	24.09 Differentiate between different types and characteristics of Aircraft fuels.		
	24.10 Discuss hazards associated with the handling of cryogenics. (liquid oxygen)		
	24.11 Draw conclusions and make inferences from data. (experiments, testing, interpolation, formulas)		
25.0	Demonstrate appropriate understanding of basic aviation corrosion control.-The student will be able to:		
	25.05 Identify symptoms/causes of delaminating. (bubbles and separation caused by temperature, pressure or external force)		
	25.06 Identify symptoms and causes of faulty bonds. (welds, surface bonds, composites)		
	25.07 Analyze welds to determine a good weld from a bad weld using one of the following techniques. (visual, dye-penetrate, or x-ray)		
27.0	Select, configure, calibrate, operate and evaluate precision test equipment.-The student will be able to:		
	27.02 Demonstrate methods used to verify tool and equipment calibration.		
	27.03 Identify precision measuring and test equipment.		
	27.04 Differentiate between destructive and non-destructive testing.		
28.0	Demonstrate knowledge and understanding of basic electricity and electronics.-The student will be able to:		
	28.04 Explain the relationships of voltage, current and power in AC circuits using Ohm's Law and Joule's Law.		
	28.05 Discuss the principals of Kirchhoff's Laws.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
28.06	Recognize common conductors, semiconductors, and insulators		
28.07	Identify the basic components of a circuit and the symbols used to represent them. Should this skill define the types of circuits?		
28.08	Identify and have knowledge of different electronic components and their values, including solid-state devices. (transistors, regulators, and etc.)		
28.09	Describe the function of motors, transformers and programmable logic controllers.		
28.10	Read and interpret aircraft electrical circuit diagrams including solid state devices and logic functions.		
28.11	Solve DC electronics problems involving series, parallel and series parallel circuits.		
28.12	Calculate and measure use of a Multi-meter to measure current, voltage, continuity, resistance, capacitance and inductance.		
28.13	Demonstrate the proper methods to test and troubleshoot different circuits using electronic test equipment.		
28.14	Interpret schematic and wiring diagrams and evaluate basic circuits for current magnitude and direction.		
28.15	Demonstrate a basic knowledge of Electrostatic Discharge (ESD).		
29.0	Demonstrate a basic knowledge of structural assembly (metallic/composite).-The student will be able to:		
29.03	Identify types of MS and AN aviation hardware.		
29.04	Show proper Torqueing techniques and calibration checks.		
29.05	Show proficiency in all types of Safety wiring.		
29.06	Application of proper of Electrical Ground and Bonding.		
30.0	Demonstrate the knowledge of quality control and the impact of products and systems.-The student will be able to:		
30.01	Collect information and evaluate its quality of a given aircraft project.		
30.02	Create a schedules, flow diagrams, or spreadsheets that show an example of computer generated quality management tools.		
30.03	Outline the different areas of Quality Elements.		
30.04	Summarize how Agency Oversight (such as FAA) effects the aircraft industry.		
31.0	Demonstrate a basic knowledge of wiring and fiber optics installation.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	31.01 Demonstrate a basic knowledge of Wiring and Fiber Optics.		
	31.02 Demonstrate proper techniques for Aviation Flight-line practices and safety.		
	31.03 Application of proper technique and safety during aircraft towing.		
	31.04 Demonstrate a basic knowledge of Fire safety on Flight-line.		
	31.05 Follow proper Flight-line foreign object debris (FOD) procedures.		
	31.06 Preform different Tower Light signals according to FAA regulations.		
	31.07 Application of proper Ground vehicle safety practices.		
	31.08 Show proper techniques and safety for servicing aircraft batteries.		
	31.09 Perform complete weight-and-balance check and record data by weighing an aircraft.		
	31.10 Start, ground operate, move, service and secure aircraft and identify typical ground operation hazards.		
33.0	Demonstrate a basic knowledge of allowance / tolerance and tolerance buildups.-The student will be able to:		
	33.01 Demonstrate a basic knowledge of Allowance.		
	33.02 Demonstrate a basic knowledge of Tolerance.		
	33.03 Identify on engineer drawings the Location of Reference Points.		
	33.04 Display on engineer drawings the Measurement (from a single point).		
	33.05 Differentiate the types of Modifier Symbols		
34.0	Demonstrate a basic knowledge of Hydraulic and Pneumatic Tubing.-The student will be able to:		
	34.01 Application of proper Hydraulic and Pneumatic Tubing Installation.		
	34.02 Application of proper manufacturing technique of Hydraulic and Pneumatic Tubing.		
	34.03 Identify and preform aircraft hydraulic and landing gear servicing.		

Florida Department of Education
Student Performance Standards

Course Title: **Aviation Assembly Technician 3**
Course Number: **9540730**
Course Credit: **1**

Course Description:
This course provides students with an introduction to the knowledge, human relations, and technical skills of aviation maintenance & fabrication technology.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Use appropriate Aviation publications on maintenance forms and records to FAA.-The student will be able to:		
19.04	Show ability to read and comprehend and apply information contained in FAA and manufacturers' aircraft maintenance specifications, data sheets, manuals, publications and related federal guidelines.		
19.05	Use aviation regulations, airworthiness directives and advisory material to perform a given task.		
19.06	Use blueprint information to an Aircraft type specific problem.		
23.0	Demonstrate the proper use and maintenance of aviation tools.-The student will be able to:		
23.12	Use proper tools to inspect finished product for conformity to all applicable standards.		
25.0	Demonstrate appropriate understanding of basic aviation corrosion control.-The student will be able to:		
25.08	Locate examples of Dissimilar Materials corrosion on given component.		
25.09	Complete project using Corrosion Prevention Methods.		
25.10	Inspect, identify, remove and treat aircraft corrosion and perform aircraft cleaning.		
26.0	prepare, analyze, and evaluate technical reports and data.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	26.02 Show the ability to write technical reports and documents. E.g. (FAA Form 337 (Major Repair and Alteration), test results, equipment malfunction, etc.)		
	26.03 Perform technical reporting and documentation.		
	26.04 Record results of an operational maintenance processes. (inspections, system checks, oiling, lubrication)		
	26.05 Demonstrate, relevant to a particular task the application of technical drawings and/or schematic specifications.		
27.0	Select, configure, calibrate, operate and evaluate precision test equipment.-The student will be able to:		
	27.05 Appraise test procedures and the ability to evaluate test results. Types of tests include: pressure checks, system operations checks, tensile, creep, compression, shear, bend, hardness, dye test, use of calipers and micrometers.		
	27.06 Preform a test by configuring test set up as per procedures and specifications.		
	27.07 Perform test operations.		
	27.08 Interpret test results.		
29.0	Demonstrate a basic knowledge of structural assembly (metallic/composite).-The student will be able to:		
	29.07 Operate equipment to properly and safely ream hole to size.		
	29.08 Operate equipment to properly and safely complete Hole Countersinking.		
	29.09 Operate equipment to properly and safely complete Dimpling – Hot and Cold.		
	29.10 Use different methods for Fastener Installation and Removal (Threaded Fastener, Blind Fastener, Lock Bolt, and Rivet).		
30.0	Demonstrate the knowledge of quality control and the impact of products and systems.-The student will be able to:		
	30.05 Describe components of ISO 9000.		
	30.06 Discuss tenants of quality assurance sciences.		
	30.07 Apply rules of Quality Assurance / Control / Checks / Inspections.		
	30.08 Provide example of Work to Approved Data.		
	30.09 List steps in the Corrective Action Processes.		
33.0	Demonstrate a basic knowledge of allowance/tolerance and tolerance buildups.-The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
33.10	Show a basic knowledge of Application of Tolerance.		
33.11	Demonstrate a basic knowledge of Cumulative Measurement (Tolerance Buildup).		
33.12	Discuss the Current Standard for GD&T		
33.13	Explain the basics of ASME Y14.5-2009 Identifies, Defines and Establishes		
33.14	List the Common Terms used in GD&T		
35.0	Demonstrate knowledge of physics, and geometry for aviation.-The student will be able to:		
35.01	Demonstrate knowledge of Algebra including: Equations, Algebraic Rules, and Order of Operation as it applies to Aviation.		
35.02	Apply the knowledge of Geometry including: Computing Area of Two-dimensional Solids, Computing Volume of Three-Dimensional Solids, Computing Surface Area of Three-dimensional Solids, Trigonometric Functions as it applies to Aviation.		
35.03	Demonstrate knowledge of Measurement Systems & the Binary Number System as it applies to Aviation.		
35.04	Evaluate how Physics including: Matter, Energy, Force, Work, Power, and Torque, Simple Machines, Motion, Heat, Pressure, Gas Laws, Fluid Mechanics, Sound, and The Atmosphere as it apply to aviation.		
35.05	Use graphs and charts information to an Aircraft type specific problem.		
36.0	Demonstrate technical knowledge of computer control as it is related to aviation/aviation projects.-The student will be able to:		
36.01	Demonstrate the application of a computer and software program to develop a plan for an aviation vehicle.		
36.02	Use problem-solving skills relative to computer assisted manufacturing related to the aviation industry.		
36.03	Receive introduction to milling, engraving or turning operation utilizing a computer assisted manufacturing program.		
37.0	Demonstrate a basic knowledge of shop practices.-The student will be able to:		
37.01	Preform a basic Non Destructive Inspection (NDI).		
37.02	Identify and select appropriate nondestructive testing methods.		
37.03	Perform basic heat-treating processes.		
37.04	Perform precision measurements.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
38.0	Demonstrate a basic knowledge of aircraft composite materials.-The student will be able to:		
38.01	Explain the uses of Advanced Composites Materials.		
38.02	Discuss the Advantages & Disadvantages of Composite Materials.		
38.03	Use proper steps in Common Composite Part Fabrication Methods.		
38.04	Discuss the Typical Composite Material Elements for Consideration in Construction		
38.05	Utilize proper methods of Health and Safety with Composite Materials.		
39.0	Demonstrate a basic knowledge of sheet metal layout, marking, measurements and spacing.-The student will be able to:		
39.01	Determine metal for Working Surface Selection and Preparation.		
39.02	Evaluate project to select appropriate marking tool(s).		
39.03	Prepare Edge Margin (Distance) and Spacing on given metal project.		
40.0	Demonstrate a basic knowledge of sealants and epoxy.-The student will be able to:		
40.01	List vocabulary use in Sealant Terminology.		
40.02	Properly and safely operate Sealant Tools and Equipment.		
40.03	Differentiate between Types of Seals (i.e., Faying, Fillet, and Dome).		
40.04	Determine the proper location of Mixing Sealants and Epoxy products.		
40.05	Apply Sealant / Epoxy Application to aircraft or aircraft equipment properly.		
41.0	Demonstrate an ability to complete a capstone project.-The student will be able to:		
41.01	Complete a repair project per drawing and specifications.		
41.02	Complete a servicing project per appropriate Aviation manuals.		
41.03	Complete an assembly project per drawing and specifications.		
41.04	Complete a metal project per drawing and specifications.		

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)

SkillsUSA is the intercurricular career and technical student organization 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.

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.

Cooperative Training – OJT

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

Accommodations

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

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

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified

for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Service Management Technology**
Career Cluster: **Transportation, Distribution and Logistics**

AAS	
CIP Number	0615080300
Program Type	College Credit
Standard Length	68 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-3093 – Tire Repairers and Changers 49-3023 – Automotive Service Technicians and Mechanics 49-9098 – Helpers--Installation, Maintenance, and Repair Workers

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to instruction in diagnosis of malfunctions in the repair of engines, fuel, electrical, cooling and brake systems; drive train and suspension systems; radiators; transmissions and carburetors; basic management concepts; troubleshooting skills; and servicing, maintaining and repairing all mechanical systems or gasoline and diesel powered automobiles including fuel, electrical, cooling, brake, drive, suspension and related systems. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive Service industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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 68 credit hours.

Standards

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

01.0 Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.
02.0 Apply electrical and electronic skills in diagnosing/troubleshooting malfunctions of electrical/electronic components.
03.0 Demonstrate proficiency in servicing steering, suspension and wheel systems.
04.0 Demonstrate proficiency in servicing automotive brake systems.
05.0 Demonstrate proficiency in servicing cooling, air conditioning and heating services.
06.0 Demonstrate proficiency in engine performance service.
07.0 Demonstrate proficiency in automatic transmission/trans-axle service.
08.0 Demonstrate proficiency in servicing manual drive trains and axles.
09.0 Demonstrate proficiency in engine repair service.
10.0 Demonstrate proficiency in management skills.
11.0 Demonstrate proficiency in appropriate communication skills.
12.0 Demonstrate proficiency in appropriate math skills.
13.0 Demonstrate proficiency in appropriate understanding of basic science.
14.0 Demonstrate proficiency in employability skills.
15.0 Demonstrate proficiency in understanding of entrepreneurship.
16.0 Demonstrate proficiency in acceptable employee behavior in the automotive industry.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Management Technology**
CIP Number: **0615080300**
Program Length: **68 credit hours**
SOC Code(s): **49-2096; 49-3093; 49-3023; 49-9098**

Refer to Rule 6A-14.030 (5), F.A.C., for the minimum amount of general education coursework required in the Associate in Applied Science (AAS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.-The student will be able to:
01.01	Apply shop safety rules, EPA and OSHA standards.
01.02	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
01.03	Identify and initiate appropriate emergency response procedures.
01.04	Identify, use and maintain hand and power tools properly.
01.05	Identify and use proper placement of floor jacks and jack stands.
01.06	Identify and practice using appropriate precision measuring tools and torque methods.
01.07	Identify and describe the proper procedure to apply and remove automotive fasteners, to include thread repair.
01.08	Identify and use metric and English measurement skills.
01.09	Use computer and operate keyboard.
01.10	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
01.11	Identify and describe typical automotive lubricants and lubricant properties.
01.12	Interpret the Federal Law as recorded in (29 CFR-1910.1200).
01.13	Identify and describe typical automotive seals and gaskets.
01.14	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
01.15	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
01.16	Demonstrate knowledge of applicable certifications.
01.17	Describe and identify supplemental restraint systems (SRS).
01.18	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
02.0	Apply electrical and electronic skills in diagnosing/troubleshooting malfunctions of electrical/electronic components.-The student will be able to:

02.01	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
02.02	Check operation of electrical circuits with a test light.
02.03	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
02.04	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
02.05	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
02.06	Check operation of electrical circuits with fused jumper wires.
02.07	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.
02.08	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
02.09	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
02.10	Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.
02.11	Replace electrical connectors and terminal ends.
02.12	Repair wiring harness.
02.13	Perform solder repair of electrical wiring.
02.14	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.
02.15	Repair CAN/BUS wiring harness.
02.16	Perform starter current draw tests; determine necessary action.
02.17	Perform starter circuit voltage drop tests; determine necessary action.
02.18	Inspect and test starter relays and solenoids; determine necessary action.
02.19	Remove and install starter in a vehicle.
02.20	Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.
02.21	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
02.22	Perform battery state-of-charge test; determine necessary action.
02.23	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
02.24	Remove, inspect, and re-install generator (alternator).
02.25	Perform charging system output test; determine necessary action.
02.26	Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.
02.27	Perform charging circuit voltage drop tests; determine necessary action.

02.28	Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action.
02.29	Aim headlights.
02.30	Identify system voltage and safety precautions associated with high-intensity discharge headlights.
02.31	Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.
02.32	Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.
02.33	Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action.
02.34	Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
02.35	Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.
02.36	Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action.
02.37	Diagnose (troubleshoot) windshield washer problems; perform necessary action.
02.38	Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
02.39	Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.
02.40	Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.
02.41	Describe the operation of keyless entry/remote-start systems.
02.42	Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.
02.43	Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.
02.44	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.
02.45	Remove and reinstall door panel.
02.46	Check for module communication errors (including CAN/BUS systems) using a scan tool.
02.47	Verify windshield wiper and washer operation, replace wiper blades.
02.48	Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.
02.49	Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.
02.50	Describe the process for software transfers, software updates, or flash reprogramming on electronic modules.
02.51	Confirm proper battery capacity and conductance for vehicle application; perform battery capacity and conductance test; determine necessary action.
02.52	Maintain or restore electronic memory functions.
02.53	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
02.54	Perform slow/fast battery charge according to manufacturer’s recommendations.

	02.55	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
	02.56	Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
	02.57	Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
	02.58	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.
03.0	Demonstrate proficiency in servicing steering, suspension and wheel systems.-The student will be able to:	
	03.01	Diagnose suspension problems.
	03.02	Diagnose wheel/tire vibrations, shimmy and tramp.
	03.03	Diagnose steering problems.
	03.04	Lubricate suspension, steering gear and linkage.
	03.05	Inspect steering systems.
	03.06	Inspect suspension systems.
	03.07	Inspect and test shock absorbers and struts.
	03.08	Check power steering fluid level and condition.
	03.09	Inspect, repair and replace tires and wheels.
	03.10	Rotate wheels and tires.
	03.11	Balance wheels.
	03.12	Service wheel bearings and grease seals on non-drive axles/spindles.
	03.13	Remove and replace spindles and ball joints.
	03.14	Remove and replace shock absorbers and strut assemblies.
	03.15	Measure and adjust torsion bar height
	03.16	Remove and replace coil springs/torsion bars
	03.17	Remove and replace control arms and bushings
	03.18	Remove and replace steering linkage components.
	03.19	Remove and replace steering dampers
	03.20	Remove and replace manual/power steering gear assemblies.
	03.21	Check and perform wheel alignment.
	03.22	Remove and replace power steering pumps.
	03.23	Check and perform four-wheel alignment.

	03.24	Disable and enable supplemental restraint system (SRS)
	03.25	Remove and replace steering wheel; center /time supplemental restraint system clock spring
	03.26	Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action
	03.27	Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps.
	03.28	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.
	03.29	Determine proper power steering fluid type; inspect fluid level and condition
	03.30	Inspect for power steering fluid leakage; determine necessary action
	03.31	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor
	03.32	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment
	03.33	Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts
	03.34	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action
	03.35	Perform pre-alignment inspection and measure vehicle ride height; perform necessary action
	03.36	Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action
	03.37	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
	03.38	Repair tire using internal patch
	03.39	Reset steering angle sensor
	03.40	Inspect electric power-assisted steering.
04.0	Demonstrate proficiency in servicing automotive brake systems.-The student will be able to:	
	04.01	Diagnose brake system problems.
	04.02	Diagnose combination valve malfunctions.
	04.03	Perform operational inspections.
	04.04	Inspect brake assemblies.
	04.05	Remove and replace calipers and rotors
	04.06	Refinish rotors
	04.07	Refinish brake drums
	04.08	Replace drum brake shoes and disc pads
	04.09	Identify anti-locking braking systems (ABS) principle and components.

	04.10	Inspect and replace brake lines and hoses
	04.11	Adjust brake shoes
	04.12	Adjust parking brakes.
	04.13	Replace/repair wheel cylinders
	04.14	Remove and replace wheel cylinders
	04.15	Bleed hydraulic brakes
	04.16	Repair or replace parking brake cables and linkage
	04.17	Remove and replace master cylinders
	04.18	Remove and replace hydraulic power boosters.
	04.19	Flush brake systems
	04.20	Service and repair power assist and brake control systems.
	04.21	Service and repair front and rear disc brakes.
	04.22	Replace vacuum brake boosters; perform necessary action.
	04.23	Inspect, diagnose and repair anti-locking brake systems.
	04.24	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.
	04.25	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
	04.26	Identify components of brake warning light system
	04.27	Inspect, test, and/or replace components of brake warning light system
	04.28	Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
	04.29	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
	04.30	Describe the operation of a regenerative braking system
	04.31	Identify and inspect electronic brake control system components; determine necessary action.
	04.32	Bleed the electronic brake control system hydraulic circuits.
05.0	Demonstrate proficiency in servicing cooling, air conditioning and heating systems.-The student will be able to:	
	05.01	Diagnose overheating problems.
	05.02	Check radiator coolant level.
	05.03	Test and add coolant

05.04	Pressure test cooling systems
05.05	Test radiator caps
05.06	Inspect, remove and replace radiator and heater hoses
05.07	Remove, test and replace thermostats.
05.08	Flush cooling systems and replace coolant.
05.09	Remove and replace radiators
05.10	Remove and replace water pumps.
05.11	Diagnose basic air conditioning system problems.
05.12	Inspect and performance test air conditioning systems.
05.13	Identify, recover, evacuate and charge basic air conditioning systems; add refrigerant and oil as needed.
05.14	Leak test basic air conditioning systems.
05.15	Service air conditioning electrical circuits.
05.16	Service vacuum circuits.
05.17	Remove and replace components in basic air conditioning systems.
05.18	Remove and replace engine fan clutches and electric cooling fan and controls.
05.19	Remove and replace blower motors.
05.20	Remove and replace heater cores, control units and cables.
05.21	Diagnose and repair electronic air conditioning controls.
05.22	Determine procedure to remove and reinstall evaporator; determine required oil quantity.
05.23	Remove, inspect, and reinstall condenser; determine required oil quantity.
05.24	Determine procedure to remove, inspect and reinstall heater core.
05.25	Identify Hybrid vehicle A/C system electrical circuits and service/safety precautions.
05.26	Using a scan tool, observe and record related HVAC data and trouble codes
05.27	Determine need and procedure for flushing A/C system and determine need for an additional A/C system filter; perform necessary action.
05.28	Diagnose temperature control problems in the HVAC system. Determine PCM ability to interrupt system operation; determine necessary action
05.29	Inspect and test heater control valve perform necessary action
05.30	Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
05.31	Determine recommended oil and oil capacity for system application

	05.32 Inspect, test, service or replace A/C compressor clutch components and or assembly; check for clutch air gap; adjust as necessary
	05.33 Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
	05.34 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
	05.35 Identify proper procedures to recycle, label, and store refrigerant.
06.0	Demonstrate proficiency in engine performance service.-The student will be able to:
	06.01 Analyze engine performance.
	06.02 Perform running cylinder balance tests.
	06.03 Perform cylinder compression tests.
	06.04 Check the engine performance and drivability using industry recognized diagnostic techniques.
	06.05 Check the ignition advance in a vehicle.
	06.06 Inspect and test primary circuits.
	06.07 Remove and replace ignition coils.
	06.08 Remove and replace ignition switches; perform necessary action.
	06.09 Inspect, remove and replace ignition wires.
	06.10 Remove, gap and replace spark plugs.
	06.11 Service electronic ignition systems.
	06.12 Service air cleaners.
	06.13 Inspect, remove and replace fuel filters; where applicable.
	06.14 Measure fuel flow and pressure.
	06.15 Remove and replace fuel lines.
	06.16 Remove and replace fuel pumps.
	06.17 Remove and replace fuel injectors
	06.18 Service fuel injection systems.
	06.19 Service positive crankcase ventilation (PCV) systems.
	06.20 Service evaporative control systems.
	06.21 Service air-injection systems.
	06.22 Service exhaust gas recirculation (EGR) systems.
	06.23 Inspect, remove and replace catalytic converter.
	06.24 Diagnose mechanical, ignition and fuel emission problems.

	06.25	Inspect, remove and replace exhaust system components.
	06.26	Perform cylinder leakage tests.
	06.27	Diagnose, test, and replace on-board computer controls.
	06.28	Diagnose, service, and replace computerized sensors.
	06.29	Remove and replace turbo chargers.
	06.30	Check turbo charger systems.
	06.31	Identify and demonstrate knowledge of basic diesel fuel systems.
	06.32	Identify and demonstrate knowledge of diesel fuel injection pump timing systems.
	06.33	Test and service diesel preheating systems.
	06.34	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
	06.35	Access and use service information to perform step-by-step (troubleshooting) diagnosis.
	06.36	Describe the importance of running all OBDII monitors for repair verification.
07.0	Demonstrate proficiency in automatic transmission/trans-axle service.-The student will be able to:	
	07.01	Performance test automatic transmissions.
	07.02	Change transmission oil and filter.
	07.03	Adjust shift linkage.
	07.04	Adjust neutral safety switches.
	07.05	Remove and replace external gaskets and seals.
	07.06	Pressure flush transmission cooler assemblies.
	07.07	Diagnose malfunctions of automatic transmissions such as fluid leaks, fluid condition, slipping, lock up and shift problems.
	07.08	Diagnose, repair and replace trans-axles.
	07.09	Service valve bodies.
	07.10	Rebuild transmission/transaxle assemblies.
	07.11	Remove and replace extension housings and bushings.
	07.12	Check fluid level in a trans. equipped with a dipstick inspect fluid condition and determine necessary action
	07.13	Identify and interpret transmission concern; differentiate between engine performance and trans. Concerns; determine necessary action
	07.14	Research applicable vehicle and service information fluid type, vehicle service history, service precautions and technical service bulletins
	07.15	Perform lock-up converter tests; determine necessary action

	07.16	Perform stall test; determine necessary action
	07.17	Perform pressure tests (including trans. equipped with electronic pressure control) determine necessary action
	07.18	Describe the operational characteristics of a Continuously Variable Trans.
	07.19	Describe the operational characteristics of a hybrid vehicle drive train
	07.20	Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses
	07.21	Remove and replace automatic transmission and transaxle mounts
	07.22	Diagnose and repair vehicle electronic speed sensors.
08.0	Demonstrate proficiency in servicing manual drivetrains and axles.-The student will be able to:	
	08.01	Diagnose manual drivetrain concerns.
	08.02	Diagnose and performance test manual transmission problems.
	08.03	Check fluid condition; check for leaks; determine necessary action.
	08.04	Research applicable vehicle and service information, fluid type, vehicle service history, service precautions and technical service bulletins.
	08.05	Inspect clutch pedal linkage, automatic adjuster mechanisms, brackets, bushings, pivots and springs; perform necessary action.
	08.06	Diagnose clutch noise, binding, slippage, pulsation and chatter; determine necessary action.
	08.07	Drain and refill manual transmission and final drive unit.
	08.08	Bleed clutch hydraulic system.
	08.09	Check and adjust clutch master cylinder fluid level; check for leaks.
	08.10	Diagnose noise concerns through the application of trans. Power-flow principles.
	08.11	Diagnose hard shifting and jumping out of gear concerns; determine necessary action.
	08.12	Diagnose trans. final drive assembly noise and vibration concerns; determine necessary action.
	08.13	Describe the operational characteristics of an electronically-controlled manual transmission.
	08.14	Inspect drive shafts, universal joints and center bearings.
	08.15	Diagnose universal joint noise and vibration concerns; perform necessary action.
	08.16	Diagnose constant velocity (cv) joint noise and vibration concerns; determine necessary action.
	08.17	Lubricate universal joints.
	08.18	Remove and replace transmission mounts.
	08.19	Remove and replace transmissions.
	08.20	Remove and replace extension housing seals and bushings.

08.21	Remove and replace clutches, release bearings, linkage and pilot bearings.
08.22	Replace clutch master and slave cylinders.
08.23	Remove and replace universal joints.
08.24	Diagnose and repair vehicle electronic speed sensors.
08.25	Remove and replace drive axle bearings and seals.
08.26	Inspect, remove and replace FWD bearings, hubs and seals
08.27	Clean and inspect diff. housing; check for leaks; inspect housing vent.
08.28	Check and adjust differential housing fluid level.
08.29	Drain and refill differential housing.
08.30	Diagnose noise and vibration concerns; determine necessary action.
08.31	Inspect and replace companion flange and pinion seal; measure companion flange run-out.
08.32	Service and repair differentials.
08.33	Remove and replace transaxle assemblies.
08.34	Adjust trans-axle shifting controls.
08.35	Inspect, remove and replace constant-velocity axle assembly.
08.36	Service manual transmissions.
08.37	Rebuild manual transmission and/or transaxle assemblies.
08.38	Disassemble, service, and reassemble transfer case and components.
08.39	Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.
09.0	Demonstrate proficiency in engine repair service.-The student will be able to:
09.01	Clean engines.
09.02	Remove and replace motor mounts.
09.03	Check valve guides for wear.
09.04	Perform cylinder balance tests.
09.05	Perform cylinder compression tests.
09.06	Perform cylinder leakage tests.
09.07	Determine source(s) of oil/coolant loss.
09.08	Determine source(s) of excess noise.
09.09	Determine cause(s) of overheating.

	09.10	Check the engine oil pressure.
	09.11	Inspect core plugs.
	09.12	Inspect, remove and replace flywheels and ring gears.
	09.13	Remove and replace engine assemblies.
	09.14	Remove and replace oil pans.
	09.15	Remove and replace oil pumps.
	09.16	Clean cylinder blocks, oil passages and pistons.
	09.17	Inspect blocks for warpage.
	09.18	Measure and inspect engine components for proper tolerances.
	09.19	Remove and replace crankshafts, mains and rod bearings.
	09.20	Remove and replace camshafts and bushings.
	09.21	Remove and replace pistons and rings.
	09.22	Remove ridges and deglaze cylinder walls.
	09.23	Remove and replace front and rear oil seals.
	09.24	Remove and replace intake and exhaust manifolds.
	09.25	Remove, clean, inspect and replace cylinder heads; and inspect heads for cracks and warpage.
	09.26	Test and replace hydraulic lifters.
	09.27	Remove and replace timing chains, belts and gears.
	09.28	Test valve springs.
	09.29	Adjust valve lifters.
	09.30	Replace rocker arm assemblies.
	09.31	Change oil and oil filters.
	09.32	Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core and galley plugs; determine necessary action.
10.0	Demonstrate proficiency in management skills.-The student will be able to:	
	10.01	Write and process work orders.
	10.02	Process parts warranties and labor claims.
	10.03	Process merchandise returns.
	10.04	Accept and return cores/cards for rebuilt and exchange items.

10.05	Select and care for shop materials.
10.06	Use supervisory techniques for hiring and firing.
10.07	Prepare technical reports.
10.08	Perform business and technical computations.
10.09	Evaluate productivity.
10.10	Develop a customer relations plan.
10.11	Plan service facilities.
10.12	Schedule production.
10.13	Plan, organize, activate and control a service operation.
10.14	Perform auto safety inspections.
11.0	Demonstrate proficiency in appropriate communication skills.-The student will be able to:
11.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
11.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
11.03	Read and follow written and oral instructions.
11.04	Answer and ask questions coherently and concisely.
11.05	Identify and use critical thinking methodologies and techniques.
12.0	Demonstrate proficiency in appropriate math skills.-The student will be able to:
12.01	Read and interpret measuring devices.
12.02	Solve number word problems.
12.03	Solve percentage problems.
12.04	Operate a calculator.
12.05	Use metric units related to auto industry.
12.06	Convert inches to millimeters and millimeters to inches.
12.07	Solve problems of length, area, volume and weight to include the circumference of a circle, the area of a rectangle, and the volume of a cylinder.
12.08	Measure size within a specified tolerance.
12.09	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
12.10	Identify various types of gears and interpret the meaning of a gear ratio number.
13.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:

13.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
13.02	Draw conclusions or make inferences from data.
13.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
13.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
14.0	Demonstrate proficiency in employability skills.-The student will be able to:
14.01	Identify employment requirements for an automotive career.
14.02	Identify documents, which may be required when applying for a job.
14.03	Complete a job application form correctly.
14.04	Identify and adopt acceptable work habits.
14.05	Identify acceptable employee health habits; including infection control of blood borne pathogens.
14.06	Demonstrate appropriate telephone/communication skills.
14.07	Conduct a job search.
14.08	Demonstrate competence in job interview techniques.
14.09	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
14.10	Demonstrate knowledge of how to make job changes appropriately.
14.11	Describe the Federal Law as recorded in (29 CFR-1910.1200).
15.0	Demonstrate proficiency in understanding of entrepreneurship.-The student will be able to:
15.01	Define entrepreneurship.
15.02	Describe the importance of entrepreneurship to the American economy.
15.03	List the advantages and disadvantages of business ownership.
15.04	Identify the risks involved in ownership of business.
15.05	Identify the necessary personal characteristics of a successful entrepreneur.
15.06	Identify the business skills needed to operate a small business efficiently and effectively.
15.07	Identify and apply communication skills used in automotive careers.
16.0	Demonstrate proficiency in acceptable employee behavior in the automotive industry.-The student will be able to:
16.01	Explain the effects of chemical/substance abuse.
16.02	Identify principles of stress management.
16.03	Identify and define career opportunities in the automotive service industry.

16.04	Demonstrate acceptable industry dress code.
16.05	Identify and demonstrate proper customer relations skills.
16.06	Identify principles of time management.
16.07	Identify acceptable customer relations.

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)

SkillsUSA is the intercurricular career and technical student organization 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 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 AAS degree program includes the following College Credit Certificates:

Automotive Service Technician (0615080301) – 24 Credit Hours
General Automotive Technician (0615080302) – 44 Credit Hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Automotive Service Technician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0615080301
Program Type	College Credit Certificate (CCC)
Standard Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-3093 – Tire Repairers and Changers 49-3023 – Automotive Service Technicians and Mechanics 49-9098 – Helpers--Installation, Maintenance, and Repair Workers

Purpose

This certificate program is part of the Automotive Service Management Technology AAS degree program (0615080300).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to instruction in diagnosis of malfunctions in the repair of electrical, brake systems, steering and suspension systems; air conditioning system; troubleshooting skills; and servicing, maintaining and repairing all mechanical systems on gasoline automobiles including electrical, cooling, brake, suspension and related systems. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive Service industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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

Standards

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

01.0 Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.
02.0 Apply electrical and electronic skills in diagnosing/troubleshooting malfunctions of electrical/electronic components.
03.0 Demonstrate proficiency in servicing steering, suspension and wheel systems.
04.0 Demonstrate proficiency in servicing automotive brake systems.
05.0 Demonstrate proficiency in servicing cooling, air conditioning and heating services.
06.0 Demonstrate proficiency in appropriate communication skills.
07.0 Demonstrate proficiency in appropriate math skills.
08.0 Demonstrate proficiency in appropriate understanding of basic science.
09.0 Demonstrate proficiency in employability skills.

2019 - 2020

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Technician**
CIP Number: **0615080301**
Program Length: **24 credit hours**
SOC Code(s): **49-2096; 49-3093; 49-3023; 49-9098**

This certificate program is part of the Automotive Service Management Technology AAS degree program (0615080300). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.-The student will be able to:
	01.01 Apply shop safety rules, EPA and OSHA standards.
	01.02 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
	01.03 Identify and initiate appropriate emergency response procedures.
	01.04 Identify, use and maintain hand and power tools properly.
	01.05 Identify and use proper placement of floor jacks and jack stands.

	01.06	Identify and practice using appropriate precision measuring tools and torque methods.
	01.07	Identify and describe the proper procedure to apply and remove automotive fasteners, to include thread repair.
	01.08	Identify and use metric and English measurement skills.
	01.09	Use computer and operate keyboard.
	01.10	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
	01.11	Identify and describe typical automotive lubricants and lubricant properties.
	01.12	Interpret the Federal Law as recorded in (29 CFR-1910.1200).
	01.13	Identify and describe typical automotive seals and gaskets.
	01.14	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
	01.15	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
	01.16	Demonstrate knowledge of applicable certifications.
	01.17	Describe and identify supplemental restraint systems (SRS).
	01.18	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
02.0	Apply electrical and electronic skills in diagnosing/troubleshooting malfunctions of electrical/electronic components.-The student will be able to:	
	02.01	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
	02.02	Check operation of electrical circuits with a test light.
	02.03	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
	02.04	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
	02.05	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm’s Law).
	02.06	Check operation of electrical circuits with fused jumper wires.
	02.07	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.
	02.08	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
	02.09	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
	02.10	Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.
	02.11	Replace electrical connectors and terminal ends.
	02.12	Repair wiring harness.

02.13	Perform solder repair of electrical wiring.
02.14	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.
02.15	Repair CAN/BUS wiring harness.
02.16	Perform starter current draw tests; determine necessary action.
02.17	Perform starter circuit voltage drop tests; determine necessary action.
02.18	Inspect and test starter relays and solenoids; determine necessary action.
02.19	Remove and install starter in a vehicle.
02.20	Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.
02.21	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
02.22	Perform battery state-of-charge test; determine necessary action.
02.23	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
02.24	Remove, inspect, and re-install generator (alternator).
02.25	Perform charging system output test; determine necessary action.
02.26	Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.
02.27	Perform charging circuit voltage drop tests; determine necessary action.
02.28	Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action.
02.29	Aim headlights.
02.30	Identify system voltage and safety precautions associated with high-intensity discharge headlights.
02.31	Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.
02.32	Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.
02.33	Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action.
02.34	Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
02.35	Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.
02.36	Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action.
02.37	Diagnose (troubleshoot) windshield washer problems; perform necessary action.
02.38	Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
02.39	Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.

	02.40	Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.
	02.41	Describe the operation of keyless entry/remote-start systems.
	02.42	Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.
	02.43	Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.
	02.44	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.
	02.45	Remove and reinstall door panel.
	02.46	Check for module communication errors (including CAN/BUS systems) using a scan tool.
	02.47	Verify windshield wiper and washer operation, replace wiper blades.
	02.48	Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.
	02.49	Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.
	02.50	Describe the process for software transfers, software updates, or flash reprogramming on electronic modules.
	02.51	Confirm proper battery capacity and conductance for vehicle application; perform battery capacity and conductance test; determine necessary action.
	02.52	Maintain or restore electronic memory functions.
	02.53	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
	02.54	Perform slow/fast battery charge according to manufacturer’s recommendations.
	02.55	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
	02.56	Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
	02.57	Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
	02.58	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.
03.0	Demonstrate proficiency in servicing steering, suspension and wheel systems.-The student will be able to:	
	03.01	Diagnose suspension problems.
	03.02	Diagnose wheel/tire vibrations, shimmy and tramp.
	03.03	Diagnose steering problems.
	03.04	Lubricate suspension, steering gear and linkage.
	03.05	Inspect steering systems.
	03.06	Inspect suspension systems.
	03.07	Inspect and test shock absorbers and struts.
	03.08	Check power steering fluid level and condition.

03.09	Inspect, repair and replace tires and wheels.
03.10	Rotate wheels and tires.
03.11	Balance wheels.
03.12	Service wheel bearings and grease seals on non-drive axles/spindles.
03.13	Remove and replace spindles and ball joints.
03.14	Remove and replace shock absorbers and strut assemblies.
03.15	Measure and adjust torsion bar height
03.16	Remove and replace coil springs/torsion bars
03.17	Remove and replace control arms and bushings
03.18	Remove and replace steering linkage components.
03.19	Remove and replace steering dampers
03.20	Remove and replace manual/power steering gear assemblies.
03.21	Check and perform wheel alignment.
03.22	Remove and replace power steering pumps.
03.23	Check and perform four-wheel alignment.
03.24	Disable and enable supplemental restraint system (SRS)
03.25	Remove and replace steering wheel; center /time supplemental restraint system clock spring
03.26	Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action
03.27	Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps.
03.28	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.
03.29	Determine proper power steering fluid type; inspect fluid level and condition
03.30	Inspect for power steering fluid leakage; determine necessary action
03.31	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor
03.32	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment
03.33	Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts
03.34	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action
03.35	Perform pre-alignment inspection and measure vehicle ride height; perform necessary action
03.36	Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air

	pressure; determine necessary action
03.37	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
03.38	Repair tire using internal patch
03.39	Reset steering angle sensor
03.40	Inspect electric power-assisted steering.
04.0	Demonstrate proficiency in servicing automotive brake systems.-The student will be able to:
04.01	Diagnose brake system problems.
04.02	Diagnose combination valve malfunctions.
04.03	Perform operational inspections.
04.04	Inspect brake assemblies.
04.05	Remove and replace calipers and rotors
04.06	Refinish rotors
04.07	Refinish brake drums
04.08	Replace drum brake shoes and disc pads
04.09	Identify anti-locking braking systems (ABS) principle and components.
04.10	Inspect and replace brake lines and hoses
04.11	Adjust brake shoes
04.12	Adjust parking brakes.
04.13	Replace/repair wheel cylinders
04.14	Remove and replace wheel cylinders
04.15	Bleed hydraulic brakes
04.16	Repair or replace parking brake cables and linkage
04.17	Remove and replace master cylinders
04.18	Remove and replace hydraulic power boosters.
04.19	Flush brake systems
04.20	Service and repair power assist and brake control systems.
04.21	Service and repair front and rear disc brakes.
04.22	Replace vacuum brake boosters; perform necessary action.
04.23	Inspect, diagnose and repair anti-locking brake systems.

	04.24	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.
	04.25	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
	04.26	Identify components of brake warning light system
	04.27	Inspect, test, and/or replace components of brake warning light system
	04.28	Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
	04.29	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
	04.30	Describe the operation of a regenerative braking system
	04.31	Identify and inspect electronic brake control system components; determine necessary action.
	04.32	Bleed the electronic brake control system hydraulic circuits.
05.0	Demonstrate proficiency in servicing cooling, air conditioning and heating systems.-The student will be able to:	
	05.01	Diagnose overheating problems.
	05.02	Check radiator coolant level.
	05.03	Test and add coolant
	05.04	Pressure test cooling systems
	05.05	Test radiator caps
	05.06	Inspect, remove and replace radiator and heater hoses
	05.07	Remove, test and replace thermostats.
	05.08	Flush cooling systems and replace coolant.
	05.09	Remove and replace radiators
	05.10	Remove and replace water pumps.
	05.11	Diagnose basic air conditioning system problems.
	05.12	Inspect and performance test air conditioning systems.
	05.13	Identify, recover, evacuate and charge basic air conditioning systems; add refrigerant and oil as needed.
	05.14	Leak test basic air conditioning systems.
	05.15	Service air conditioning electrical circuits.
	05.16	Service vacuum circuits.
	05.17	Remove and replace components in basic air conditioning systems.

05.18	Remove and replace engine fan clutches and electric cooling fan and controls.
05.19	Remove and replace blower motors.
05.20	Remove and replace heater cores, control units and cables.
05.21	Diagnose and repair electronic air conditioning controls.
05.22	Determine procedure to remove and reinstall evaporator; determine required oil quantity.
05.23	Remove, inspect, and reinstall condenser; determine required oil quantity.
05.24	Determine procedure to remove, inspect and reinstall heater core.
05.25	Identify Hybrid vehicle A/C system electrical circuits and service/safety precautions.
05.26	Using a scan tool, observe and record related HVAC data and trouble codes
05.27	Determine need and procedure for flushing A/C system and determine need for an additional A/C system filter; perform necessary action.
05.28	Diagnose temperature control problems in the HVAC system. Determine PCM ability to interrupt system operation; determine necessary action
05.29	Inspect and test heater control valve perform necessary action
05.30	Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
05.31	Determine recommended oil and oil capacity for system application
05.32	Inspect, test, service or replace A/C compressor clutch components and or assembly; check for clutch air gap; adjust as necessary
05.33	Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
05.34	Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
05.35	Identify proper procedures to recycle, label, and store refrigerant.
06.0	Demonstrate proficiency in appropriate communication skills.-The student will be able to:
06.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
06.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
06.03	Read and follow written and oral instructions.
06.04	Answer and ask questions coherently and concisely.
06.05	Identify and use critical thinking methodologies and techniques.
07.0	Demonstrate proficiency in appropriate math skills.-The student will be able to:
07.01	Read and interpret measuring devices.
07.02	Solve number word problems.

	07.03	Solve percentage problems.
	07.04	Operate a calculator.
	07.05	Use metric units related to auto industry.
	07.06	Convert inches to millimeters and millimeters to inches.
	07.07	Solve problems of length, area, volume and weight to include the circumference of a circle, the area of a rectangle, and the volume of a cylinder.
	07.08	Measure size within a specified tolerance.
	07.09	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	07.10	Identify various types of gears and interpret the meaning of a gear ratio number.
08.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:	
	08.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	08.02	Draw conclusions or make inferences from data.
	08.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	08.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
09.0	Demonstrate proficiency in employability skills.-The student will be able to:	
	09.01	Identify employment requirements for an automotive career.
	09.02	Identify documents, which may be required when applying for a job.
	09.03	Complete a job application form correctly.
	09.04	Identify and adopt acceptable work habits.
	09.05	Identify acceptable employee health habits; including infection control of blood borne pathogens.
	09.06	Demonstrate appropriate telephone/communication skills.
	09.07	Conduct a job search.
	09.08	Demonstrate competence in job interview techniques.
	09.09	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	09.10	Demonstrate knowledge of how to make job changes appropriately.
	09.11	Describe the Federal Law as recorded in (29 CFR-1910.1200).

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)

SkillsUSA is the intercurricular career and technical student organization 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 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: **General Automotive Technician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0615080302
Program Type	College Credit Certificate (CCC)
Standard Length	44 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-3093 – Tire Repairers and Changers 49-3023 – Automotive Service Technicians and Mechanics 49-9098 – Helpers--Installation, Maintenance, and Repair Workers

Purpose

This certificate program is part of the Automotive Service Management Technology AAS degree program 0615080300.

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to instruction in diagnosis of malfunctions in the repair of electrical, brake systems, steering and suspension systems; air conditioning system; diagnostics, automatic and manual transmissions, troubleshooting skills; and servicing, maintaining and repairing all mechanical systems on gasoline automobiles including electrical, cooling, brake, suspension and related systems. The course content may include training in communication, leadership, human relations and employability skills; and safe, efficient work practices. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive Service industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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

Standards

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

01.0 Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.
02.0 Apply electrical and electronic skills in diagnosing/troubleshooting malfunctions of electrical/electronic components.
03.0 Demonstrate proficiency in servicing steering, suspension and wheel systems.
04.0 Demonstrate proficiency in servicing automotive brake systems.
05.0 Demonstrate proficiency in servicing cooling, air conditioning and heating services.
06.0 Demonstrate proficiency in engine performance service.
07.0 Demonstrate proficiency in automatic transmission/trans-axle service.
08.0 Demonstrate proficiency in servicing manual drive trains and axles.
09.0 Demonstrate proficiency in engine repair service.
10.0 Demonstrate proficiency in appropriate communication skills.
11.0 Demonstrate proficiency in appropriate math skills.
12.0 Demonstrate proficiency in appropriate understanding of basic science.
13.0 Demonstrate proficiency in employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **General Automotive Technician**
CIP Number: **0615080302**
Program Length: **44 Credit Hours**
SOC Code(s): **49-2096; 49-3093; 49-3023; 49-9098**

This certificate program is part of the Automotive Service Management Technology AAS degree program 0615080300. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry-The student will be able to:
01.01	Apply shop safety rules, EPA and OSHA standards.
01.02	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
01.03	Identify and initiate appropriate emergency response procedures.
01.04	Identify, use and maintain hand and power tools properly.
01.05	Identify and use proper placement of floor jacks and jack stands.
01.06	Identify and practice using appropriate precision measuring tools and torque methods.
01.07	Identify and describe the proper procedure to apply and remove automotive fasteners, to include thread repair.
01.08	Identify and use metric and English measurement skills.
01.09	Use computer and operate keyboard.
01.10	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
01.11	Identify and describe typical automotive lubricants and lubricant properties.
01.12	Interpret the Federal Law as recorded in (29 CFR-1910.1200).
01.13	Identify and describe typical automotive seals and gaskets.
01.14	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
01.15	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
01.16	Demonstrate knowledge of applicable certifications.
01.17	Describe and identify supplemental restraint systems (SRS).
01.18	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
02.0	Apply electrical and electronic skills in diagnosing/troubleshooting malfunctions of electrical/electronic components.-The student will be able to:

02.01	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
02.02	Check operation of electrical circuits with a test light.
02.03	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
02.04	Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
02.05	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
02.06	Check operation of electrical circuits with fused jumper wires.
02.07	Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.
02.08	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.
02.09	Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
02.10	Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.
02.11	Replace electrical connectors and terminal ends.
02.12	Repair wiring harness.
02.13	Perform solder repair of electrical wiring.
02.14	Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.
02.15	Repair CAN/BUS wiring harness.
02.16	Perform starter current draw tests; determine necessary action.
02.17	Perform starter circuit voltage drop tests; determine necessary action.
02.18	Inspect and test starter relays and solenoids; determine necessary action.
02.19	Remove and install starter in a vehicle.
02.20	Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.
02.21	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
02.22	Perform battery state-of-charge test; determine necessary action.
02.23	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
02.24	Remove, inspect, and re-install generator (alternator).
02.25	Perform charging system output test; determine necessary action.
02.26	Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.
02.27	Perform charging circuit voltage drop tests; determine necessary action.

02.28	Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action.
02.29	Aim headlights.
02.30	Identify system voltage and safety precautions associated with high-intensity discharge headlights.
02.31	Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.
02.32	Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.
02.33	Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action.
02.34	Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
02.35	Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.
02.36	Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action.
02.37	Diagnose (troubleshoot) windshield washer problems; perform necessary action.
02.38	Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
02.39	Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.
02.40	Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.
02.41	Describe the operation of keyless entry/remote-start systems.
02.42	Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.
02.43	Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.
02.44	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.
02.45	Remove and reinstall door panel.
02.46	Check for module communication errors (including CAN/BUS systems) using a scan tool.
02.47	Verify windshield wiper and washer operation, replace wiper blades.
02.48	Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.
02.49	Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.
02.50	Describe the process for software transfers, software updates, or flash reprogramming on electronic modules.
02.51	Confirm proper battery capacity and conductance for vehicle application; perform battery capacity and conductance test; determine necessary action.
02.52	Maintain or restore electronic memory functions.
02.53	Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
02.54	Perform slow/fast battery charge according to manufacturer’s recommendations.

	02.55	Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
	02.56	Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
	02.57	Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
	02.58	Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.
03.0	Demonstrate proficiency in servicing steering, suspension and wheel systems-The student will be able to:	
	03.01	Diagnose suspension problems.
	03.02	Diagnose wheel/tire vibrations, shimmy and tramp.
	03.03	Diagnose steering problems.
	03.04	Lubricate suspension, steering gear and linkage.
	03.05	Inspect steering systems.
	03.06	Inspect suspension systems.
	03.07	Inspect and test shock absorbers and struts.
	03.08	Check power steering fluid level and condition.
	03.09	Inspect, repair and replace tires and wheels.
	03.10	Rotate wheels and tires.
	03.11	Balance wheels.
	03.12	Service wheel bearings and grease seals on non-drive axles/spindles.
	03.13	Remove and replace spindles and ball joints.
	03.14	Remove and replace shock absorbers and strut assemblies.
	03.15	Measure and adjust torsion bar height
	03.16	Remove and replace coil springs/torsion bars
	03.17	Remove and replace control arms and bushings
	03.18	Remove and replace steering linkage components.
	03.19	Remove and replace steering dampers
	03.20	Remove and replace manual/power steering gear assemblies.
	03.21	Check and perform wheel alignment.
	03.22	Remove and replace power steering pumps.
	03.23	Check and perform four-wheel alignment.

	03.24	Disable and enable supplemental restraint system (SRS)
	03.25	Remove and replace steering wheel; center /time supplemental restraint system clock spring
	03.26	Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action
	03.27	Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps.
	03.28	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.
	03.29	Determine proper power steering fluid type; inspect fluid level and condition
	03.30	Inspect for power steering fluid leakage; determine necessary action
	03.31	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor
	03.32	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment
	03.33	Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts
	03.34	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action
	03.35	Perform pre-alignment inspection and measure vehicle ride height; perform necessary action
	03.36	Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action
	03.37	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
	03.38	Repair tire using internal patch
	03.39	Reset steering angle sensor
	03.40	Inspect electric power-assisted steering.
04.0	Demonstrate proficiency in servicing automotive brake systems.-The student will be able to:	
	04.01	Diagnose brake system problems.
	04.02	Diagnose combination valve malfunctions.
	04.03	Perform operational inspections.
	04.04	Inspect brake assemblies.
	04.05	Remove and replace calipers and rotors
	04.06	Refinish rotors
	04.07	Refinish brake drums
	04.08	Replace drum brake shoes and disc pads
	04.09	Identify anti-locking braking systems (ABS) principle and components.

	04.10	Inspect and replace brake lines and hoses
	04.11	Adjust brake shoes
	04.12	Adjust parking brakes.
	04.13	Replace/repair wheel cylinders
	04.14	Remove and replace wheel cylinders
	04.15	Bleed hydraulic brakes
	04.16	Repair or replace parking brake cables and linkage
	04.17	Remove and replace master cylinders
	04.18	Remove and replace hydraulic power boosters.
	04.19	Flush brake systems
	04.20	Service and repair power assist and brake control systems.
	04.21	Service and repair front and rear disc brakes.
	04.22	Replace vacuum brake boosters; perform necessary action.
	04.23	Inspect, diagnose and repair anti-locking brake systems.
	04.24	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.
	04.25	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
	04.26	Identify components of brake warning light system
	04.27	Inspect, test, and/or replace components of brake warning light system
	04.28	Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
	04.29	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
	04.30	Describe the operation of a regenerative braking system
	04.31	Identify and inspect electronic brake control system components; determine necessary action.
	04.32	Bleed the electronic brake control system hydraulic circuits.
05.0	Demonstrate proficiency in servicing cooling, air conditioning and heating systems.-The student will be able to:	
	05.01	Diagnose overheating problems.
	05.02	Check radiator coolant level.
	05.03	Test and add coolant

05.04	Pressure test cooling systems
05.05	Test radiator caps
05.06	Inspect, remove and replace radiator and heater hoses
05.07	Remove, test and replace thermostats.
05.08	Flush cooling systems and replace coolant.
05.09	Remove and replace radiators
05.10	Remove and replace water pumps.
05.11	Diagnose basic air conditioning system problems.
05.12	Inspect and performance test air conditioning systems.
05.13	Identify, recover, evacuate and charge basic air conditioning systems; add refrigerant and oil as needed.
05.14	Leak test basic air conditioning systems.
05.15	Service air conditioning electrical circuits.
05.16	Service vacuum circuits.
05.17	Remove and replace components in basic air conditioning systems.
05.18	Remove and replace engine fan clutches and electric cooling fan and controls.
05.19	Remove and replace blower motors.
05.20	Remove and replace heater cores, control units and cables.
05.21	Diagnose and repair electronic air conditioning controls.
05.22	Determine procedure to remove and reinstall evaporator; determine required oil quantity.
05.23	Remove, inspect, and reinstall condenser; determine required oil quantity.
05.24	Determine procedure to remove, inspect and reinstall heater core.
05.25	Identify Hybrid vehicle A/C system electrical circuits and service/safety precautions.
05.26	Using a scan tool, observe and record related HVAC data and trouble codes
05.27	Determine need and procedure for flushing A/C system and determine need for an additional A/C system filter; perform necessary action.
05.28	Diagnose temperature control problems in the HVAC system. Determine PCM ability to interrupt system operation; determine necessary action
05.29	Inspect and test heater control valve perform necessary action
05.30	Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
05.31	Determine recommended oil and oil capacity for system application

	05.32 Inspect, test, service or replace A/C compressor clutch components and or assembly; check for clutch air gap; adjust as necessary
	05.33 Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
	05.34 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
	05.35 Identify proper procedures to recycle, label, and store refrigerant.
06.0	Demonstrate proficiency in engine performance service.-The student will be able to:
	06.01 Analyze engine performance.
	06.02 Perform running cylinder balance tests.
	06.03 Perform cylinder compression tests.
	06.04 Check the engine performance and drivability using industry recognized diagnostic techniques.
	06.05 Check the ignition advance in a vehicle.
	06.06 Inspect and test primary circuits.
	06.07 Remove and replace ignition coils.
	06.08 Remove and replace ignition switches; perform necessary action.
	06.09 Inspect, remove and replace ignition wires.
	06.10 Remove, gap and replace spark plugs.
	06.11 Service electronic ignition systems.
	06.12 Service air cleaners.
	06.13 Inspect, remove and replace fuel filters; where applicable.
	06.14 Measure fuel flow and pressure.
	06.15 Remove and replace fuel lines.
	06.16 Remove and replace fuel pumps.
	06.17 Remove and replace fuel injectors
	06.18 Service fuel injection systems.
	06.19 Service positive crankcase ventilation (PCV) systems.
	06.20 Service evaporative control systems.
	06.21 Service air-injection systems.
	06.22 Service exhaust gas recirculation (EGR) systems.
	06.23 Inspect, remove and replace catalytic converter.
	06.24 Diagnose mechanical, ignition and fuel emission problems.

	06.25	Inspect, remove and replace exhaust system components.
	06.26	Perform cylinder leakage tests.
	06.27	Diagnose, test, and replace on-board computer controls.
	06.28	Diagnose, service, and replace computerized sensors.
	06.29	Remove and replace turbo chargers.
	06.30	Check turbo charger systems.
	06.31	Identify and demonstrate knowledge of basic diesel fuel systems.
	06.32	Identify and demonstrate knowledge of diesel fuel injection pump timing systems.
	06.33	Test and service diesel preheating systems.
	06.34	Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
	06.35	Access and use service information to perform step-by-step (troubleshooting) diagnosis.
	06.36	Describe the importance of running all OBDII monitors for repair verification.
07.0	Demonstrate proficiency in automatic transmission/trans-axle service.-The student will be able to:	
	07.01	Performance test automatic transmissions.
	07.02	Change transmission oil and filter.
	07.03	Adjust shift linkage.
	07.04	Adjust neutral safety switches.
	07.05	Remove and replace external gaskets and seals.
	07.06	Pressure flush transmission cooler assemblies.
	07.07	Diagnose malfunctions of automatic transmissions such as fluid leaks, fluid condition, slipping, lock up and shift problems.
	07.08	Diagnose, repair and replace trans-axles.
	07.09	Service valve bodies.
	07.10	Rebuild transmission/transaxle assemblies.
	07.11	Remove and replace extension housings and bushings.
	07.12	Check fluid level in a trans. equipped with a dipstick inspect fluid condition and determine necessary action
	07.13	Identify and interpret transmission concern; differentiate between engine performance and trans. Concerns; determine necessary action
	07.14	Research applicable vehicle and service information fluid type, vehicle service history, service precautions and technical service bulletins
	07.15	Perform lock-up converter tests; determine necessary action

	07.16	Perform stall test; determine necessary action
	07.17	Perform pressure tests (including trans. equipped with electronic pressure control) determine necessary action
	07.18	Describe the operational characteristics of a Continuously Variable Trans.
	07.19	Describe the operational characteristics of a hybrid vehicle drive train
	07.20	Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses
	07.21	Remove and replace automatic transmission and transaxle mounts
	07.22	Diagnose and repair vehicle electronic speed sensors.
08.0	Demonstrate proficiency in servicing manual drivetrains and axles.-The student will be able to:	
	08.01	Diagnose manual drivetrain concerns.
	08.02	Diagnose and performance test manual transmission problems.
	08.03	Check fluid condition; check for leaks; determine necessary action.
	08.04	Research applicable vehicle and service information, fluid type, vehicle service history, service precautions and technical service bulletins.
	08.05	Inspect clutch pedal linkage, automatic adjuster mechanisms, brackets, bushings, pivots and springs; perform necessary action.
	08.06	Diagnose clutch noise, binding, slippage, pulsation and chatter; determine necessary action.
	08.07	Drain and refill manual transmission and final drive unit.
	08.08	Bleed clutch hydraulic system.
	08.09	Check and adjust clutch master cylinder fluid level; check for leaks.
	08.10	Diagnose noise concerns through the application of trans. power-flow principles.
	08.11	Diagnose hard shifting and jumping out of gear concerns; determine necessary action.
	08.12	Diagnose trans. final drive assembly noise and vibration concerns; determine necessary action.
	08.13	Describe the operational characteristics of an electronically-controlled manual transmission.
	08.14	Inspect drive shafts, universal joints and center bearings.
	08.15	Diagnose universal joint noise and vibration concerns; perform necessary action.
	08.16	Diagnose constant velocity (cv) joint noise and vibration concerns; determine necessary action.
	08.17	Lubricate universal joints.
	08.18	Remove and replace transmission mounts.
	08.19	Remove and replace transmissions.
	08.20	Remove and replace extension housing seals and bushings.

08.21	Remove and replace clutches, release bearings, linkage and pilot bearings.
08.22	Replace clutch master and slave cylinders.
08.23	Remove and replace universal joints.
08.24	Diagnose and repair vehicle electronic speed sensors.
08.25	Remove and replace drive axle bearings and seals.
08.26	Inspect, remove and replace FWD bearings, hubs and seals
08.27	Clean and inspect diff. housing; check for leaks; inspect housing vent.
08.28	Check and adjust differential housing fluid level.
08.29	Drain and refill differential housing.
08.30	Diagnose noise and vibration concerns; determine necessary action.
08.31	Inspect and replace companion flange and pinion seal; measure companion flange run-out.
08.32	Service and repair differentials.
08.33	Remove and replace transaxle assemblies.
08.34	Adjust trans-axle shifting controls.
08.35	Inspect, remove and replace constant-velocity axle assembly.
08.36	Service manual transmissions.
08.37	Rebuild manual transmission and/or transaxle assemblies.
08.38	Disassemble, service, and reassemble transfer case and components.
08.39	Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.
09.0	Demonstrate proficiency in engine repair service.-The student will be able to:
09.01	Clean engines.
09.02	Remove and replace motor mounts.
09.03	Check valve guides for wear.
09.04	Perform cylinder balance tests.
09.05	Perform cylinder compression tests.
09.06	Perform cylinder leakage tests.
09.07	Determine source(s) of oil/coolant loss.
09.08	Determine source(s) of excess noise.
09.09	Determine cause(s) of overheating.

	09.10	Check the engine oil pressure.
	09.11	Inspect core plugs.
	09.12	Inspect, remove and replace flywheels and ring gears.
	09.13	Remove and replace engine assemblies.
	09.14	Remove and replace oil pans.
	09.15	Remove and replace oil pumps.
	09.16	Clean cylinder blocks, oil passages and pistons.
	09.17	Inspect blocks for warpage.
	09.18	Measure and inspect engine components for proper tolerances.
	09.19	Remove and replace crankshafts, mains and rod bearings.
	09.20	Remove and replace camshafts and bushings.
	09.21	Remove and replace pistons and rings.
	09.22	Remove ridges and deglaze cylinder walls.
	09.23	Remove and replace front and rear oil seals.
	09.24	Remove and replace intake and exhaust manifolds.
	09.25	Remove, clean, inspect and replace cylinder heads; and inspect heads for cracks and warpage.
	09.26	Test and replace hydraulic lifters.
	09.27	Remove and replace timing chains, belts and gears.
	09.28	Test valve springs.
	09.29	Adjust valve lifters.
	09.30	Replace rocker arm assemblies.
	09.31	Change oil and oil filters.
	09.32	Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core and galley plugs; determine necessary action.
10.0	Demonstrate proficiency in appropriate communication skills.-The student will be able to:	
	10.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	10.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	10.03	Read and follow written and oral instructions.
	10.04	Answer and ask questions coherently and concisely.

	10.05 Identify and use critical thinking methodologies and techniques.
11.0	Demonstrate proficiency in appropriate math skills.-The student will be able to:
	11.01 Read and interpret measuring devices.
	11.02 Solve number word problems.
	11.03 Solve percentage problems.
	11.04 Operate a calculator.
	11.05 Use metric units related to auto industry.
	11.06 Convert inches to millimeters and millimeters to inches.
	11.07 Solve problems of length, area, volume and weight to include the circumference of a circle, the area of a rectangle, and the volume of a cylinder.
	11.08 Measure size within a specified tolerance.
	11.09 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	11.10 Identify various types of gears and interpret the meaning of a gear ratio number.
12.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:
	12.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	12.02 Draw conclusions or make inferences from data.
	12.03 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	12.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
13.0	Demonstrate proficiency in employability skills.-The student will be able to:
	13.01 Identify employment requirements for an automotive career.
	13.02 Identify documents, which may be required when applying for a job.
	13.03 Complete a job application form correctly.
	13.04 Identify and adopt acceptable work habits.
	13.05 Identify acceptable employee health habits; including infection control of blood borne pathogens.
	13.06 Demonstrate appropriate telephone/communication skills.
	13.07 Conduct a job search.
	13.08 Demonstrate competence in job interview techniques.
	13.09 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	13.10 Demonstrate knowledge of how to make job changes appropriately.

13.11 Describe the Federal Law as recorded in (29 CFR-1910.1200).

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)

SkillsUSA is the intercurricular career and technical student organization 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 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: **Manufacture-Specific Automotive Service Technology**
Career Cluster: **Transportation, Distribution and Logistics**

AAS	
CIP Number	0647060407
Program Type	College Credit
Standard Length	74 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to a written business plan that establishes a partnership agreement between the educational institution and the automotive industry.

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 74 credit hours.

Standards

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

01.0 Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.
02.0 Demonstrate proficiency in appropriate math skills.
03.0 Demonstrate proficiency in appropriate understanding of basic sciences.
04.0 Demonstrate proficiency in employability skills.
05.0 Demonstrate proficiency in appropriate communication skills.
06.0 Demonstrate proficiency in understanding of entrepreneurship.
07.0 Demonstrate proficiency in acceptable employee behavior in the automotive industry.
08.0 Demonstrate proficiency in management skills.
09.0 Demonstrate proficiency in engine theory and repairs.
10.0 Demonstrate proficiency in the operation and servicing of automatic transmission/trans-axle.
11.0 Demonstrate proficiency in the operation and servicing of manual drive trains and axles.
12.0 Demonstrate proficiency in the operation of steering and suspension systems.
13.0 Demonstrate proficiency in the operation and servicing of automotive brake systems.
14.0 Demonstrate proficiency in diagnosing/troubleshooting electrical/electronic components as related to power train.
15.0 Demonstrate proficiency in heating, air conditioning and engine cooling systems.
16.0 Demonstrate proficiency in engine performance service.

Florida Department of Education
Student Performance Standards

Program Title: **Manufacture-Specific Automotive Service Technology**
CIP Numbers: **0647060407**
Program Length: **74 credit hours**
SOC Code(s): **49-3023**

Refer to Rule 6A-14.030 (5), F.A.C., for the minimum amount of general education coursework required in the Associate in Applied Science (AAS) degree. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.-The student will be able to:
01.01	Apply shop safety rules, EPA and OSHA standards.
01.02	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
01.03	Identify and initiate appropriate emergency response procedures.
01.04	Identify, use and maintain hand and power tools properly.
01.05	Identify and use proper placement of floor jacks and jack stands.
01.06	Identify and practice using appropriate precision measuring tools and torque methods.
01.07	Identify and describe the proper procedure to apply and remove automotive fasteners, to include thread repair.
01.08	Identify and use metric and English measurement skills.
01.09	Use computer and operate keyboard.
01.10	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
01.11	Identify and describe typical automotive lubricants and lubricant properties.
01.12	Interpret the Federal Law as recorded in (29 CFR-1910.1200).
01.13	Identify and describe typical automotive seals and gaskets.
01.14	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
01.15	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
01.16	Demonstrate knowledge of applicable certifications.
01.17	Describe and identify supplemental restraint systems (SRS).
01.18	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
02.0	Demonstrate proficiency in appropriate math skills.-The student will be able to:

02.01	Read and interpret measuring devices.
02.02	Solve number word problems.
02.03	Solve percentage problems.
02.04	Operate a calculator.
02.05	Use metric units related to auto industry.
02.06	Convert inches to millimeters and millimeters to inches.
02.07	Solve problems of length, area, volume and weight to include the circumference of a circle, the area of a rectangle, and the volume of a cylinder.
02.08	Measure size within a specified tolerance.
02.09	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
02.10	Identify various types of gears and interpret the meaning of a gear ratio number.
03.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:
03.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
03.02	Draw conclusions or make inferences from data.
03.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
03.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
04.0	Demonstrate proficiency in employability skills.-The student will be able to:
04.01	Identify employment requirements for an automotive career.
04.02	Identify documents, which may be required when applying for a job.
04.03	Complete a job application form correctly.
04.04	Identify and adopt acceptable work habits.
04.05	Identify acceptable employee health habits; including infection control of blood borne pathogens.
04.06	Demonstrate appropriate telephone/communication skills.
04.07	Conduct a job search.
04.08	Demonstrate competence in job interview techniques.
04.09	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
04.10	Demonstrate knowledge of how to make job changes appropriately.
04.11	Describe the Federal Law as recorded in (29 CFR-1910.1200).

05.0	Demonstrate proficiency in appropriate communication skills.-The student will be able to:
05.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
05.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
05.03	Read and follow written and oral instructions.
05.04	Answer and ask questions coherently and concisely.
05.05	Identify and use critical thinking methodologies and techniques.
06.0	Demonstrate proficiency in understanding of entrepreneurship.-The student will be able to:
06.01	Define entrepreneurship.
06.02	Describe the importance of entrepreneurship to the American economy.
06.03	List the advantages and disadvantages of business ownership.
06.04	Identify the risks involved in ownership of business.
06.05	Identify the necessary personal characteristics of a successful entrepreneur.
06.06	Identify the business skills needed to operate a small business efficiently and effectively.
06.07	Identify and apply communication skills used in automotive careers.
07.0	Demonstrate proficiency in acceptable employee behavior in the automotive industry.-The student will be able to:
07.01	Explain the effects of chemical/substance abuse.
07.02	Identify principles of stress management.
07.03	Identify and define career opportunities in the automotive service industry.
07.04	Demonstrate acceptable industry dress code.
07.05	Identify and demonstrate proper customer relations skills.
07.06	Identify principles of time management.
07.07	Identify acceptable customer relations.
08.0	Demonstrate proficiency in management skills.-The student will be able to:
08.01	Write and process work orders.
08.02	Process parts warranties and labor claims.
08.03	Process merchandise returns.
08.04	Accept and return cores/cards for rebuilt and exchange items.

08.05	Select and care for shop materials.
08.06	Use supervisory techniques for hiring and firing.
08.07	Prepare technical reports.
08.08	Perform business and technical computations.
08.09	Evaluate productivity.
08.10	Develop a customer relations plan.
08.11	Plan service facilities.
08.12	Schedule production.
08.13	Plan, organize, activate and control a service operation.
08.14	Perform auto safety inspections.
09.0	Demonstrate proficiency in engine theory and repair.-The student will be able to:
09.01	Interpret and verify complaint; determine necessary action.
09.02	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
09.03	Listen to engine noises; determine necessary action.
09.04	Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action.
09.05	Perform engine vacuum tests; determine necessary action.
09.06	Perform cylinder power balance tests; determine necessary action.
09.07	Perform cylinder compression tests; determine necessary action.
09.08	Perform cylinder leakage tests; determine necessary action.
09.09	Remove and re-install engine.
09.10	Identify hybrid vehicle internal combustion engine service precautions.
Cylinder Head and Valve Train Diagnosis and Repair	
09.11	Remove cylinder head(s); inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition.
09.12	Install cylinder heads and gaskets; tighten according to manufacturer’s specifications and procedures.
09.13	Inspect and test valve springs for squareness, pressure, and free height comparison; replace as needed.
09.14	Inspect valve spring retainers, locks, and valve grooves.
09.15	Replace valve stem seals.
09.16	Inspect valve guides for wear; check valve guide height and stem- to-guide clearance; determine necessary action.

09.17	Inspect valves; determine necessary action.
09.18	Inspect valve seats; determine necessary action.
09.19	Check valve face-to-seat contact and valve seat concentricity (run out); determine necessary action.
09.20	Check valve spring assembled height and valve stem height; service valve and spring assemblies as needed.
09.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); repair or replace.
09.22	Inspect hydraulic or mechanical lifters; replace as needed.
09.23	Adjust valves (mechanical or hydraulic lifters).
09.24	Inspect and replace camshaft drives (including gear wear and backlash, sprocket and chain wear, overhead cam drive sprockets, drive belts, belt tension, and tensioners).
09.25	Inspect camshaft for run out; measure journals and lobes for wear.
09.26	Inspect and measure camshaft bearings for wear, damage, out of round, and alignment; determine necessary action.
09.27	Verify camshaft(s) timing according to manufacturer's specifications and procedure.
09.28	Service product specific cam drive systems.
09.29	Perform product specific valve adjustments.
09.30	Remove and replace valve cover gaskets.
Engine Block Diagnosis and Repair	
09.31	Inspect and replace pans, covers, gaskets, and seals.
09.32	Inspect engine block for cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed repairs.
09.33	Inspect internal and external threads; repair as needed.
09.34	Remove cylinder wall ridges.
09.35	Inspect and measure cylinder walls for damage and wear; determine necessary action.
09.36	Deglaze and clean cylinder walls.
09.37	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
09.38	Inspect crankshaft for surface cracks and journal damage; check oil passage condition; measure journal wear; determine necessary action.
09.39	Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selections of bearings).
09.40	Identify position and bearing wear patterns that include connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition.
09.41	Inspect, measure, service or replace pistons.

09.42	Inspect, measure, and install piston rings.
09.43	Inspect, repair or replace crankshaft vibration damper (harmonic balancer).
09.44	Inspect flywheel or flex-plate and ring gear for cracks and wear; measure run out; determine necessary action.
09.45	Inspect, remove, and replace crankshaft pilot bearing or bushing (as applicable).
09.46	Reassemble engine components using correct gaskets and sealants.
09.47	Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.
Lubrication and Cooling Systems Diagnosis and Repairs	
09.48	Prime engine lubrication system.
09.49	Perform oil pressure tests; determine necessary action.
09.50	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; replace as needed.
09.51	Perform cooling system tests (pressure, combustion leakage, and temperature); determine necessary action.
09.52	Inspect, replace, and adjust drive belts and pulleys.
09.53	Inspect and replace engine cooling and heater system hoses.
09.54	Inspect, test, and replace thermostat and housing.
09.55	Inspect coolant; drain, flush, and refill cooling system with recommended coolant and bleed air as required.
09.56	Inspect, test, remove, and replace water pump.
09.57	Inspect and test radiator, pressure cap, and coolant recovery system; remove and replace radiator.
09.58	Clean, inspect, and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.
09.59	Inspect and test electrical fan control system and circuits.
09.60	Inspect auxiliary oil coolers; replace as needed.
09.61	Inspect, test, and replace oil temperature and pressure switches and sensors.
09.62	Perform oil and filter change.
10.0	Demonstrate proficiency in the operation and servicing of automatic transmission/transaxle.-The student will be able to:
10.01	Interpret and verify driver’s complaint; verify proper engine operation; determine necessary action.
10.02	Diagnose unusual fluid usage, level, and condition problems; determine necessary action.
10.03	Perform pressure tests; determine necessary action.
10.04	Perform stall tests; determine necessary action.
10.05	Perform lock-up converter system tests; determine necessary action.

10.06	Diagnose electronic, mechanical, and vacuum control systems; determine necessary action.
10.07	Diagnose noise and vibration problems; determine necessary action.
Transmission and Transaxle Maintenance and Adjustment	
10.08	Inspect, adjust or replace manual shift valve and throttle (TV) linkages or cables and check gear select indicator (as applicable).
10.09	Service transmission; perform visual inspection; replace fluids and filters.
In-Vehicle Transmission and Transaxle Repair	
10.10	Inspect and replace external seals and gaskets.
10.11	Inspect extension housing; replace bushing and seals.
10.12	Inspect, leak test, flush, and replace cooler, lines, and fittings.
10.13	Inspect, measure, clean, and replace valve body (includes surfaces and bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets); check/adjust valve body bolt torque.
10.14	Inspect servo bore, piston, seals, pin, spring, and retainers; repair or replace as needed.
10.15	Inspect accumulator bore, piston, seals, spring, and retainer; repair or replace as needed.
10.16	Inspect, test, adjust, repair or replace transmission related electrical and electronic components (includes computers, solenoids, sensors, relays, switches, and harnesses).
10.17	Inspect, replace, and align power train mounts.
Off-Vehicle Transmission and Transaxle Repair (Removal, Disassembly, and Reinstallation)	
10.18	Remove and reinstall transmission/transaxle and torque converter.
10.19	Disassemble, clean, and inspect transmission/transaxle.
10.20	Assemble transmission/transaxle.
Oil Pump and Converter	
10.21	Inspect converter flex plate, attaching parts, pilot drive, pump drive, and seal areas.
10.22	Measure torque converter end play and check for interference check stator clutch.
10.23	Inspect, measure, and replace oil pump housings, shafts, vanes, rotors, gears, valves, seals, and bushings.
10.24	Check torque converter and transmission cooling system for contamination.
Gear Train, Shafts, Bushings and Case	
10.25	Check end play or preload; determine needed service.
10.26	Inspect, measure, and replace thrust washers and bearings.
10.27	Inspect oil delivery seal rings, ring grooves, and sealing surface areas.
10.28	Inspect bushings; replace as needed.

10.29	Inspect and measure planetary gear assembly (includes sun, ring gear, thrust washers, planetary gears, and carrier assembly); replace as needed.
10.30	Inspect cases, bores, passages, bushings, vents, and mating surfaces; replace as needed.
10.31	Inspect transaxle drive, link chains, sprockets, gears, bearings and bushings; replace as needed.
10.32	Inspect, measure, repair, adjust or replace transaxle final drive components.
10.33	Inspect and reinstall parking pawl, shaft, spring, and retainer; replace as needed.
Friction and Reaction Units	
10.34	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; replace as needed.
10.35	Measure clutch pack clearance; adjust as needed.
10.36	Air test operation of clutch and servo assemblies.
10.37	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; replace as needed.
10.38	Inspect bands and drums; replace as needed.
11.0	Demonstrate proficiency in the operation and assembly of manual drive transmission/transaxle.-The student will be able to:
11.01	Diagnose clutch noise, binding, slippage, pulsation, and chatter problems; determine necessary action.
11.02	Inspect, adjust or replace clutch pedal linkage, automatic adjuster mechanisms, brackets, bushings, pivots, and springs.
11.03	Inspect, adjust, repair or replace hydraulic clutch slave master-cylinders, lines, and hoses.
11.04	Inspect, adjust or replace release (throw-out) bearing, lever, and pivot.
11.05	Inspect and replace clutch pressure plate assembly and clutch disc.
11.06	Inspect, remove or replace crankshaft pilot bearing or bushing (as applicable).
11.07	Inspect, repair, and service or replace flywheel and ring gear.
11.08	Inspect engine block, clutch (bell) housing, and transmission case mating surface; determine necessary action.
11.09	Measure flywheel-to-block run out and crankshaft end play; determine necessary action.
11.10	Measure clutch (bell) housing bore-to-crankshaft run out and face squareness; determine needed service.
11.11	Inspect accumulator bore, piston, seals, spring, and retainer; repair or replace as needed.
Transmission Diagnosis and Repair	
11.12	Diagnose transmission noise, hard shifting, jumping out of gear, and fluid leakage problems; determine necessary action.
11.13	Inspect, adjust, and replace transmission shift linkages, brackets, bearings, cables, pivots, and levers.
11.14	Inspect, replace, and align power train mounts.
11.15	Inspect and replace transmission gaskets, seals, and sealants; Inspect sealing surfaces.

11.16	Remove and reinstall transmission.
11.17	Disassemble, clean, and reassemble transmission components.
11.18	Inspect, adjust, and reinstall transmission shift cover, forks, grommets, levers, shafts, sleeves, detent mechanisms, interlocks, and springs.
11.19	Inspect and reinstall input (clutch) shaft and bearings.
11.20	Inspect and reinstall main shaft, gears, thrust washers, bearings, and retainers.
11.21	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.
11.22	Inspect and reinstall counter (cluster) gear, shaft, bearings, thrust washers, and retainers; check end play; adjust as needed.
11.23	Inspect and reinstall reverse idler gear, shaft, bearings, thrust washers, and retainers; check end play; adjust as needed.
11.24	Inspect, repair, and replace extension housing and transmission case mating surfaces, bores, bushings, and vents.
11.25	Inspect lubrication devices (oil pump or slingers).
Transaxle Diagnosis and Repair	
11.26	Diagnose transaxle noise, hard shifting, jumping out of gear, and fluid leakage problem; determine necessary action.
11.27	Inspect, adjust, and reinstall transaxle shift linkages, brackets, bushings, cables, pivots, and levers.
11.28	Inspect and reinstall power train mounts.
11.29	Remove and reinstall transaxle.
11.30	Inspect and replace transaxle gaskets, seals, and sealants; inspect sealing surfaces.
11.31	Remove and replace transaxle final drive.
11.32	Disassemble and clean transaxle final drive.
11.33	Inspect, adjust, and reinstall transaxle shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.
11.34	Inspect and reinstall input (clutch) shaft and bearings.
11.35	Inspect and reinstall output shaft, gears, thrust washers, bearings, and retainers.
11.36	Measure end play or preload (shim or spacer selection procedure) on transaxle shafts; adjust as needed.
11.37	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.
11.38	Inspect and reinstall reverse idler gear, shaft, bearings, thrust washers, and retainers.
11.39	Inspect transaxle case, mating surfaces, bores, bushings, and vents.
11.40	Diagnose differential assembly noise and vibration problems; determine necessary action.
11.41	Remove, inspect, measure, adjust, and reinstall differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.

11.42	Inspect lubrication devices (oil pump or slingers).
Drive and Half Shaft Universal and Constant-Velocity (CV) Joint Diagnosis and Repair	
11.43	Diagnose constant-velocity (CV) joint noise and vibration problems; determine necessary action.
11.44	Diagnose universal joint noise and vibration problems; determine necessary action.
11.45	Diagnose front wheel drive (FWD) front wheel bearing noise and vibration problems; determine necessary action.
11.46	Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
11.47	Inspect, service, and replace shaft center support bearings.
11.48	Check and correct shaft balance; measure shaft run out; measure and adjust driveline angles.
Rear Axle Diagnosis and Repair; Ring and Pinion Gears and Differential Case Assembly	
11.49	Diagnose noise and vibration problems; determine necessary action.
11.50	Diagnose fluid leakage problems; determine necessary action.
11.51	Inspect and replace companion flange and pinion seal; measure companion flange run out.
11.52	Inspect ring gear and measure run out; determine necessary action.
11.53	Remove and inspect drive pinion gear, spacers, sleeves, and bearings.
11.54	Measure and adjust drive pinion depth.
11.55	Measure and adjust drive pinion bearing preload.
11.56	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup and shim types).
11.57	Check ring and pinion tooth contact patterns; adjust as needed.
11.58	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.
11.59	Reassemble and reinstall differential case assembly; measure run out; determine necessary action.
Limited Slip Differential	
11.60	Diagnose noise, slippage, and chatter problems; determine necessary action.
11.61	Inspect and flush differential housing; refill with correct lubricant.
11.62	Inspect and reinstall clutch (cone or plate) components.
11.63	Measure rotating torque; determine necessary action.
11.64	Verify matching tires & tolerances.
Axle Shaft	
11.65	Diagnose rear axle shafts, bearings, and seals for noise, vibration, and fluid leakage problems; determine necessary action.

11.66	Inspect and replace rear axle shaft wheel studs.
11.67	Remove and replace rear axle shafts.
11.68	Inspect and replace rear axle shaft seals, bearings, and retainers.
11.69	Measure rear axle flange run out and shaft end play; determine necessary action.
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
11.70	Diagnose noise, vibration, and unusual steering problems; determine necessary action.
11.71	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
11.72	Remove and reinstall transfer case.
11.73	Disassemble, service, and reassemble transfer case and components.
11.74	Inspect, service, and replace front-wheel bearings and locking hubs.
11.75	Check drive assembly seals and vents; check lube level.
11.76	Inspect viscous coupling assembly.
11.77	Verify matching tires & tolerances.
12.0	Demonstrate proficiency in the operation of steering and suspension systems.-The student will be able to:
12.01	Disable supplemental restraint system (SRS) in accordance with manufacturer's procedures.
12.02	Diagnose steering column noises, looseness, and binding problems (including tilt mechanisms); determine necessary action.
12.03	Diagnose power non-rack and pinion steering gear binding, uneven turning effort, looseness, hard steering, and fluid leakage problems; determine necessary action.
12.04	Diagnose power rack and pinion steering gear vibration, looseness, and hard steering problems; determine necessary action.
12.05	Inspect and replace steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel.
12.06	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
12.07	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
12.08	Inspect manual and power steering fluid levels and condition.
12.09	Flush, fill, and bleed power steering system.
12.10	Diagnose power steering fluid leakage; determine necessary action.
12.11	Inspect, replace, and adjust power steering pump belt.
12.12	Remove, inspect, and replace power steering pump, pump mounts, pump seals, and gaskets.
12.13	Remove, inspect, and replace power steering pump pulley; check alignment.
12.14	Perform power steering system pressure test; determine needed repairs.

12.15	Inspect and replace power steering hoses and fittings.
12.16	Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
12.17	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
12.18	Diagnose, inspect, adjust, repair or replace components of electronically-controlled steering systems.
12.19	Diagnose, inspect, repair or replace components of variable-assist steering systems.
12.20	Inspect electrical power assisted steering.
Suspension Systems Diagnosis and Repair; Front Suspensions	
12.21	Diagnose short and long arm suspension system noises, body sway, and uneven riding height problems; determine necessary action.
12.22	Diagnose MacPherson strut suspension system noises body sway, and uneven riding height problems; determine necessary action.
12.23	Remove, inspect, and replace upper and lower control arms, bushings, shafts, and rebound bumpers.
12.24	Remove, inspect, replace, and adjust strut (compression/tension) rods and bushings.
12.25	Remove, inspect, and replace upper and lower ball joints on short and long arm suspension systems.
12.26	Remove, inspect, and replace steering knuckle assemblies.
12.27	Remove, inspect, and replace short and long arm suspension system coil springs and spring insulators.
12.28	Remove, inspect, replace, and adjust suspension system torsion bars; inspect mounts.
12.29	Remove, inspect and replace stabilizer bar bushings, brackets, and links.
12.30	Remove, inspect, and replace ball joints on MacPherson strut suspension systems.
12.31	Remove, inspect, and replace MacPherson strut assembly, strut coil spring, insulators, and upper strut bearing mount.
12.32	Lubricate suspension and steering systems.
Rear Suspensions	
12.33	Remove, inspect, and replace coil springs and spring insulators.
12.34	Remove, inspect, and replace transverse links, control arms, bushings, and mounts.
12.35	Remove, inspect, and replace leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
12.36	Remove, inspect, and replace MacPherson strut assembly, strut coil spring, and insulators (silencers).
Miscellaneous Service	
12.37	Inspect, remove, and replace shock absorbers.
12.38	Remove, inspect, and service or replace front and rear wheel bearings.
12.39	Diagnose, inspect, adjust, repair or replace components of electronically-controlled suspension systems.

Wheel Alignment Diagnosis, Adjustment, and Repair	
12.40	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return problems; determine necessary action.
12.41	Measure vehicle riding height; determine necessary action.
12.42	Check and adjust front and rear wheel camber; determine needed repairs.
12.43	Check and adjust caster; determine necessary action.
12.44	Check and adjust front wheel toe; adjust as needed.
12.45	Center steering wheel.
12.46	Check toe-out-on-turns (turning radius); determine needed repairs.
12.47	Check SAI (steering axis inclination) and included angle; determine necessary action.
12.48	Check and adjust rear wheel toe.
12.49	Check rear wheel thrust angle; determine necessary action.
12.50	Check for front wheel setback; determine necessary action.
12.51	Check front cradle (subframe) alignment; determine needed repairs.
12.52	Reset steering angle sensor.
Wheel and Tire Diagnosis and Repair	
12.53	Inspect tires, diagnose tire wear patterns; check and adjust air pressure.
12.54	Diagnose wheel/tire vibration, shimmy, and noise problems; determine necessary action.
12.55	Rotate tires according to manufacturer's recommendations.
12.56	Measure wheel, tire, axle, and hub run out; determine needed repairs.
12.57	Diagnose tire pull (lead) problem; determine corrective actions.
12.58	Balance wheel and tire assembly (static and dynamic).
12.59	Dismount, inspect, repair, and remount tire on wheel.
12.60	Reinstall wheel; torque lug nuts.
12.61	Identify and test pressure monitoring system (indirect and direct) for operation; calibrate system, verify operation of instrument panel lamps.
12.62	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.
13.0	Demonstrate proficiency in the operation and servicing of automotive brake system.-The student will be able to:
13.01	Measure brake pedal height, travel, and free play; determine necessary action.
13.02	Check master cylinder for internal and external leaks and proper operation; determine necessary action.

13.03	Remove, bench bleed, and replace master cylinder.
13.04	Diagnose poor stopping, pulling or dragging caused by problems in the hydraulic system; determine necessary action.
13.05	Inspect brake lines and fittings for leaks, dents, kinks, rust, cracks or wear; tighten loose fittings and supports.
13.06	Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; tighten loose fittings and supports.
13.07	Fabricate and install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed.
13.08	Select, handle, store, and install brake fluids to proper level.
13.09	Inspect, test, and replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.
13.10	Inspect, test, replace, and adjust height (load) sensing proportioning valve.
13.11	Inspect, test, and replace components of brake warning light system.
13.12	Bleed (manual, pressure, vacuum or surge) brake system; flush hydraulic system.
Drum Brake Diagnosis and Repair	
13.13	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation problems; determine necessary action.
13.14	Remove, clean (using proper safety procedures), inspect, and measure brake drums; service or replace as needed.
13.15	Mount brake drum on lathe machine braking surface.
13.16	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
13.17	Remove and reinstall wheel cylinders.
13.18	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
13.19	Reinstall wheel, torque lug nuts, and make final checks and adjustments.
Disc Brake Diagnosis and Repair	
13.20	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation caused problems; determine necessary action.
13.21	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing.
13.22	Clean and inspect caliper mounting and slides for wear and damage.
13.23	Remove, clean, and inspect pads and retaining hardware; determine needed service.
13.24	Reassemble, lubricate, and reinstall caliper, pads, and related hardware.
13.25	Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer’s recommendations in determining need to machine or replace.
13.26	Refinish rotor according to manufacturer’s recommendations.
13.27	Adjust calipers with integrated parking brake system.
13.28	Fill master cylinder with recommended fluid and seat pads; inspect caliper for leaks.

13.29	Reinstall wheel, torque lug nuts, and make final checks and adjustments.
13.30	Remove and replace rotor.
Power Assist Units Diagnosis and Repair	
13.31	Test pedal free travel with and without engine running; check power assist operation.
13.32	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
13.33	Inspect hydro and/or vacuum-type power booster unit for proper operation; repair or replace parts as needed.
Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair	
13.34	Diagnose wheel bearing noises, wheel shimmy, and vibration problems; determine necessary action.
13.35	Remove, clean, inspect, repack, and reinstall wheel bearings and replace seals; reinstall hub and adjust wheel bearings.
13.36	Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, and replace as needed.
13.37	Check parking brake operation; adjust as needed.
13.38	Check operation of parking brake indicator light system.
13.39	Check operation of brake stop light system; adjust and service as needed.
13.40	Replace wheel bearing and race.
Electronic Brake, Traction, and Stability Control Systems Diagnosis and Repair	
13.41	Inspect, test, and service anti-lock brake system (ABS) hydraulic, electrical, and mechanical components.
13.42	Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise problems caused by the anti-lock brake system (ABS); determine necessary action.
13.43	Observe anti-lock brake system (ABS) warning light(s) at startup; determine if further diagnosis is needed.
13.44	Diagnose anti-lock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action.
13.45	Depressurize high pressure components of the anti-lock brake system (ABS) following manufacturer's recommended safety procedures.
13.46	Fill the anti-lock brake system (ABS) master cylinder with recommended fluid following manufacturer's procedures; inspect system for leaks.
13.47	Bleed the anti-lock brake system's (ABS) front and rear hydraulic circuits following manufacturer's procedures.
13.48	Remove and install anti-lock brake system (ABS) electrical/electronic/hydraulic components following manufacturer's procedures and specifications.
13.49	Service, test, and adjust anti-lock brake system (ABS) speed sensors following manufacturer's recommended procedures.
13.50	Diagnose anti-lock brake system (ABS) braking problems caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
13.51	Identify and inspect electronic brake control systems; determine necessary action.

13.52	Identify traction control and vehicle stability control systems components.
13.53	Describe the operation of a regenerative braking system.
14.0	Demonstrate proficiency in diagnosing/troubleshooting electrical/electronic related components.-The student will be able to:
14.01	Use wiring diagrams during diagnosis of electrical circuit problems.
14.02	Check electrical circuits with a test light; determine necessary action.
14.03	Check voltage and voltage drop in electrical/electronic circuits using a digital multi-meter (DMM); determine needed repairs.
14.04	Check current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.
14.05	Check electrical circuits using jumper wires; determine necessary action.
14.06	Find shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
14.07	Measure and diagnose the cause(s) of abnormal key-off battery drain, parasitic draw; determine necessary action.
14.08	Inspect and test fusible links, circuit breakers, and fuses; replace as needed.
14.09	Inspect and test switches, connectors, relays, and wires of electrical/electronic circuits; repair or replace as needed.
Battery Diagnosis and Service	
14.10	Perform battery state-of-charge test; determine needed service.
14.11	Perform battery capacity and conductance (load, high-rate discharge) test; determine needed service.
14.12	Maintain or restore electronic memory functions.
14.13	Inspect, clean, and replace battery.
14.14	Perform slow/fast battery charge.
14.15	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.
14.16	Start a vehicle using jumper cables using a battery auxiliary power supply.
14.17	Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
14.18	Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
Starting System Diagnosis and Repair	
14.19	Perform starter current draw and circuit voltage drop test; determine necessary action.
14.20	Inspect and test starter relays and solenoids; replace as needed.
14.21	Remove and replace/reinstall starter.
14.22	Perform starter bench tests; determine necessary action.
14.23	Inspect, test, and repair or replace switches, connectors, and wires of starter control circuits.

14.24	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
Charging System Diagnosis and Repair	
14.25	Diagnose charging system problems that cause an undercharge, a no-charge or an overcharge condition.
14.26	Inspect and adjust alternator drive belts; replace as needed.
14.27	Remove, inspect, and replace/reinstall alternator.
14.28	Perform charging circuit voltage drop tests; determine needed repairs.
Lighting Systems Diagnosis and Repair	
14.29	Diagnose brighter than normal, intermittent, dim or no light operation.
14.30	Inspect, replace, and aim headlights and bulbs.
14.31	Inspect and diagnose incorrect turn signal or hazard light operation; repair or replace as needed.
14.32	Identify system voltage and safety precautions associated with high-intensity discharge headlights.
Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair	
14.33	Diagnose intermediate, high, low or no gauge readings.
14.34	Inspect and test gauges and gauge sending units; replace as needed.
14.35	Inspect and test connectors, wires, and printed circuit boards of gauge circuits; repair or replace as needed.
14.36	Diagnose incorrect operation of warning devices and other driver information systems.
14.37	Diagnose intermediate, high, low or no readings on electronic instrument clusters.
14.38	Inspect and test sensors, sending units, connectors, and wires of electronic instrument circuits; repair or replace as needed.
Horn and Wiper/Washer Diagnosis and Repair	
14.39	Diagnose incorrect horn operation; repair as needed.
14.40	Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; repair as needed.
14.41	Diagnose incorrect windshield washer operation; repair as needed.
Accessories Diagnosis and Repair	
14.42	Diagnose incorrect operation of motor-driven accessory circuits; repair as needed.
14.43	Diagnose incorrect heated glass operation; repair as needed.
14.44	Diagnose incorrect electric door and hatch/trunk lock operation; repair as needed.
14.45	Diagnose incorrect operation of cruise control systems; repair as needed.
14.46	Diagnose supplemental restraint system (SRS) problems; repair as needed. (NOTE: Follow manufacturer's safety procedures to prevent accidental deployment.)

14.47	Diagnose radio static and weak, intermittent, or no radio reception.
14.48	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.
14.49	Remove and reinstall door panel.
14.50	Describe the process for software transfers, software updates, or flash reprogramming on electrical modules.
15.0	Demonstrate proficiency in heating, air conditioning and engine cooling systems.-The student will be able to:
15.01	Diagnose unusual operating noises in the A/C system; determine necessary action.
15.02	Conduct a performance test of the A/C system; determine needed repairs.
15.03	Leak test a/c system; determine necessary action.
15.04	Inspect the condition of discharged oil.
15.05	Select oil type; measure and add oil to the A/C system as needed.
15.06	Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
Refrigeration System Component Diagnosis and Repair Compressor and Clutch	
15.07	Diagnose A/C system problems that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.
15.08	Inspect A/C compressor drive belts; replace as needed.
15.09	Inspect, test, and replace A/C compressor clutch components or assembly.
15.10	Remove and replace A/C compressor and mountings.
15.11	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.
Evaporator, Receiver/Drier, Condenser, Etc.	
15.12	Diagnose A/C system problems caused by too much moisture in the refrigerant; determine necessary action.
15.13	Install A/C system filter.
15.14	Remove and inspect A/C system mufflers, hoses, lines, fittings, o-rings, seals, and service valves; replace as needed.
15.15	Inspect A/C condenser for air flow restrictions; service as required.
15.16	Inspect receiver/drier or accumulator/drier; replace as needed.
15.17	Inspect and test expansion valve or orifice (expansion) tube; replace as needed.
15.18	Inspect evaporator housing water drain; repair as needed.
Heating and Engine Cooling Systems Diagnosis and Repair	
15.19	Diagnose temperature control problems in the heater/ventilation system; determine necessary action.
15.20	Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.

15.21	Inspect engine cooling and heater system hoses and belts; replace as needed.
15.22	Inspect, test, and replace thermostat and housing.
15.23	Determine coolant condition; drain and recover.
15.24	Flush system and refill with recommended coolant; bleed system.
15.25	Clean, inspect, and test fan, fan clutch (electrical and mechanical), fan shroud, and air dams; replace as needed.
15.26	Inspect and test heater control valve(s); replace as needed.
Operating Systems and Related Controls Diagnosis and Repairs	
15.27	Diagnose failures in the electrical controls of heating and A/C systems; determine necessary action.
15.28	Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; repair as needed.
15.29	Test A/C compressor load cut-off systems; determine needed repairs.
15.30	Using a scan tool, observe and record related HVAC data and trouble codes.
Vacuum/Mechanical	
15.31	Diagnose failure in the vacuum and mechanical controls of the heating and A/C system; determine necessary action.
15.32	Inspect and test A/C-heater control panel assembly; replace as needed.
15.33	Inspect and test A/C-heater control cables and linkages adjust or replace as needed.
15.34	Inspect and test A/C-heater vacuum control switches, hoses, diaphragms (motor), vacuum reservoir, check valve, and restrictors; replace as needed.
15.35	Inspect and test A/C-heater ducts, doors, hoses, and outlets; replace as needed.
Automatic and Semi-Automatic Temperature Controls	
15.36	Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.
Refrigerant Recovery, Recycling, and Handling	
15.37	Verify correct operation and maintenance of refrigerant handling equipment.
15.38	Identify and recover A/C system refrigerant.
15.39	Recycle refrigerant.
15.40	Label and store refrigerant.
15.41	Evaluate and charge A/C system.
16.0	Demonstrate proficiency in engine performance services.-The student will be able to:
16.01	Interpret and verify complaint; determine necessary action.
16.02	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

16.03	Diagnose unusual engine noise or vibration problems; determine necessary action.
16.04	Diagnose unusual exhaust color, odor, and sound; determine needed action.
16.05	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
16.06	Perform cylinder power balance test; determine needed action.
16.07	Perform cylinder compression test; determine needed action.
16.08	Perform cylinder leakage test; determine needed action.
16.09	Diagnose engine mechanical, electrical, electronic, fuel and ignition problems with an oscilloscope and engine diagnostic equipment; determine needed action.
Computerized Engine Controls Diagnosis and Repair	
16.10	Diagnose emissions or drive-ability problems resulting from of computerized engine controls with no diagnostic trouble codes stored; determine necessary action.
16.11	Retrieve and record stored diagnostic trouble codes.
16.12	Diagnose the causes of emissions or drive-ability problems resulting from failure of computerized engine controls with stored diagnostic trouble codes.
16.13	Inspect, test, adjust, and replace computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits.
16.14	Obtain and interpret digital multi-meter (DMM) readings.
16.15	Access and use electronic service information (ESI).
16.16	Locate and interpret vehicle and major component identification number (VIN, vehicle certification labels and calibration decals).
16.17	Inspect and test power and ground circuits and connections; service or replace as needed.
16.18	Practice recommended precautions when handling static sensitive devices.
16.19	Diagnose drive-ability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, torque controls, suspension controls, traction controls, torque management, A/C, automatic transmissions, and similar systems); determine necessary action.
16.20	Update diagnostic scanner.
16.21	Perform product specific OBD II drive cycle diagnostic tests.
Ignition System Diagnosis and Repair	
16.22	Diagnose no-starting, drive-ability, and emissions problems on vehicles with electronic ignition (distributor-less) systems; determine necessary action.
16.23	Diagnose no-starting, drive-ability, and emissions problems on vehicles with distributor ignition (DI) systems; determine needed repairs.
16.24	Inspect and test ignition primary circuit wiring and components; repair or replace as needed.
16.25	Inspect and test ignition system secondary circuit wiring and components; replace as needed.
16.26	Inspect and test ignition coil(s); replace as needed.

16.27	Inspect and test ignition wiring harness and connectors; replace as needed.
16.28	Inspect and test ignition system pick-up sensors or triggering devices including crankshaft and camshaft sensors; replace as needed.
16.29	Inspect, test, and/or replace ignition control module and powertrain/engine control module; reprogram as needed.
16.30	Service product specific ignition systems.
16.31	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair	
16.32	Diagnose hot or cold no-starting, hard starting, poor drive-ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel system; determine needed action.
16.33	Inspect fuel tank and fuel cap; inspect and replace fuel lines, fittings, and hoses.
16.34	Check fuel for contaminants and quality.
16.35	Inspect and test fuel pumps and pump control systems; replace as needed.
16.36	Replace fuel filters.
16.37	Inspect and test fuel pressure regulation system and components.
16.38	Remove, clean, and reinstall throttle body; adjust related linkages
16.39	Inspect and test fuel injectors; clean and replace.
16.40	Inspect throttle body mounting plates, air induction and filtration system, intake manifold, and gaskets; clean or replace as needed.
16.41	Remove, inspect, and test vacuum and electrical components and connections of fuel system; repair or replace as needed.
16.42	Inspect exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, and heat shields; repair or replace as needed.
16.43	Perform exhaust system back-pressure test; determine needed action.
16.44	Test the operation of turbocharger/supercharger systems; determine needed action.
16.45	Remove, clean, inspect, and repair or replace turbocharger/supercharger system components.
16.46	Identify the causes of turbocharger/supercharger failure; determine needed action.
16.47	Inspect and test catalytic converter efficiency.
16.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.
16.49	Check and refill diesel exhaust fluid (DEF).
Emissions Control Systems Diagnosis and Repair Positive Crankcase Ventilation	
16.50	Diagnose oil leaks, emissions, and drive-ability problems resulting from failure of the positive crankcase ventilation (PCV) system.
16.51	Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.

Exhaust Gas Recirculation	
16.52	Diagnose emissions and drive-ability problems caused by failure of the exhaust gas recirculation (EGR) system.
16.53	Inspect and test valve, valve manifold, and exhaust passages of exhaust gas recirculation (EGR) systems; service or replace as needed.
16.54	Inspect and test vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; service or replace as needed.
16.55	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; repair or replace as needed.
Exhaust Gas Treatment	
16.56	Diagnose emissions and drive-ability problems resulting from failure of the secondary air injection and catalytic converter systems.
16.57	Inspect and test mechanical components of secondary air injection systems; service or replace as needed.
16.58	Inspect and test electrical/electronically-operated components and circuits of air injection systems; replace as needed.
16.59	Inspect and test components of catalytic converter systems; replace as needed.
Evaporative Emissions Controls	
16.60	Diagnose emissions and drive-ability problems resulting from failure of evaporative emissions control system.
16.61	Inspect and test components and hoses of evaporative emissions control system; replace as needed.
Engine Related Service	
16.62	Adjust valves on engines with mechanical or hydraulic lifters.
16.63	Verify correct camshaft timing; determine needed action.
16.64	Verify engine operating temperature; determine needed action.
16.65	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; service or replace as needed.
16.66	Inspect and test thermostat, by-pass, and housing; replace as needed.
16.67	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; service or replace as needed.

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

The purpose of this program is to prepare students for employment and/or specialized training in the automotive industry. The program provides specialized corporate/association job preparatory training.

Automotive Technology Programs sponsored by automobile manufacturers require an internship at a dealership.

The program must be NATEF Master Certified and have a business plan approved by the appropriate industry affiliated organization. Instructors must be ASE Certified in all areas that they teach in addition to being certified in Engine Performance and Electrical/Electronic Systems. ASE Master Technician and Advanced Engine Performance (L1) ASE Certification is preferred. Instructors must meet the specific product certification as specified in the business plan.

Program must meet the equipment and specialty tool requirement as specified in the business plan. Must offer Federally recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization 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 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:

Dealer Service Technician (0647060419) – 27 credit hours
Dealer Line Technician (0647060418) – 53 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Dealer Line Technician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060418
Program Type	College Credit
Standard Length	53 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics

Purpose

This certificate program is part of the Manufacture-Specific Automotive Service Technology AAS degree program (0647060407).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to instruction in diagnosis of malfunctions in the repair of electrical, brake systems, steering and suspension systems; troubleshooting skills; and servicing, maintaining and repairing all mechanical systems on gasoline automobiles including electrical, brake, suspension and related systems. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive Service industry; technical and product skills, underlying principles of technology, and health, safety, and environmental issues.

The content includes but is not limited to a written business plan that establishes a partnership agreement between the educational institution and the automotive industry.

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

Standards

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

01.0 Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.
02.0 Demonstrate proficiency in appropriate math skills.
03.0 Demonstrate proficiency in appropriate understanding of basic sciences.
04.0 Demonstrate proficiency in employability skills.
05.0 Demonstrate proficiency in appropriate communication skills.
06.0 Demonstrate proficiency in acceptable employee behavior in the automotive industry.
07.0 Demonstrate proficiency in engine theory and repairs.
08.0 Demonstrate proficiency in the operation and servicing of automatic transmission/trans-axle.
09.0 Demonstrate proficiency in the operation and servicing of manual drive trains and axles.
10.0 Demonstrate proficiency in the operation of steering and suspension systems.
11.0 Demonstrate proficiency in the operation and servicing of automotive brake systems.
12.0 Demonstrate proficiency in diagnosing/troubleshooting electrical/electronic components as related to power train.
13.0 Demonstrate proficiency in heating, air conditioning and engine cooling systems.
14.0 Demonstrate proficiency in engine performance service.

Florida Department of Education
Student Performance Standards

Program Title: **Dealer Line Technician**
CIP Numbers: **0647060418**
Program Length: **53 credit hours**
SOC Code(s): **49-3023**

This certificate program is part of the Dealer-Specific Automotive Technology / New Name 2017-2018, Manufacture-Specific Automotive Service Technology AAS degree program (0647060407). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.-The student will be able to:
01.01	Apply shop safety rules, EPA and OSHA standards.
01.02	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
01.03	Identify and initiate appropriate emergency response procedures.
01.04	Identify, use and maintain hand and power tools properly.
01.05	Identify and use proper placement of floor jacks and jack stands.
01.06	Identify and practice using appropriate precision measuring tools and torque methods.
01.07	Identify and describe the proper procedure to apply and remove automotive fasteners, to include thread repair.
01.08	Identify and use metric and English measurement skills.
01.09	Use computer and operate keyboard.
01.10	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
01.11	Identify and describe typical automotive lubricants and lubricant properties.
01.12	Interpret the Federal Law as recorded in (29 CFR-1910.1200).
01.13	Identify and describe typical automotive seals and gaskets.
01.14	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
01.15	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
01.16	Demonstrate knowledge of applicable certifications.
01.17	Describe and identify supplemental restraint systems (SRS).
01.18	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
02.0	Demonstrate proficiency in appropriate math skills.-The student will be able to:
02.01	Read and interpret measuring devices.

	02.02	Solve number word problems.
	02.03	Solve percentage problems.
	02.04	Operate a calculator.
	02.05	Use metric units related to auto industry.
	02.06	Convert inches to millimeters and millimeters to inches.
	02.07	Solve problems of length, area, volume and weight to include the circumference of a circle, the area of a rectangle, and the volume of a cylinder.
	02.08	Measure size within a specified tolerance.
	02.09	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	02.10	Identify various types of gears and interpret the meaning of a gear ratio number.
03.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:	
	03.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	03.02	Draw conclusions or make inferences from data.
	03.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	03.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
04.0	Demonstrate proficiency in employability skills.-The student will be able to:	
	04.01	Identify employment requirements for an automotive career.
	04.02	Identify documents, which may be required when applying for a job.
	04.03	Complete a job application form correctly.
	04.04	Identify and adopt acceptable work habits.
	04.05	Identify acceptable employee health habits; including infection control of blood borne pathogens.
	04.06	Demonstrate appropriate telephone/communication skills.
	04.07	Conduct a job search.
	04.08	Demonstrate competence in job interview techniques.
	04.09	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	04.10	Demonstrate knowledge of how to make job changes appropriately.
	04.11	Describe the Federal Law as recorded in (29 CFR-1910.1200).
05.0	Demonstrate proficiency in appropriate communication skills.-The student will be able to:	

05.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
05.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
05.03	Read and follow written and oral instructions.
05.04	Answer and ask questions coherently and concisely.
06.0	Demonstrate proficiency in acceptable employee behavior in the automotive industry.-The student will be able to:
06.01	Explain the effects of chemical/substance abuse.
06.02	Identify principles of stress management.
06.03	Identify and define career opportunities in the automotive service industry.
06.04	Demonstrate acceptable industry dress code.
06.05	Identify and demonstrate proper customer relations skills.
06.06	Identify principles of time management.
06.07	Identify acceptable customer relations.
07.0	Demonstrate proficiency in engine theory and repair.-The student will be able to:
07.01	Interpret and verify complaint; determine necessary action.
07.02	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
07.03	Listen to engine noises; determine necessary action.
07.04	Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action.
07.05	Perform engine vacuum tests; determine necessary action.
07.06	Perform cylinder power balance tests; determine necessary action.
07.07	Perform cylinder compression tests; determine necessary action.
07.08	Perform cylinder leakage tests; determine necessary action.
07.09	Remove and re-install engine.
07.10	Identify hybrid vehicle internal combustion engine service precautions.
Cylinder Head and Valve Train Diagnosis and Repair	
07.11	Remove cylinder head(s); inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition.
07.12	Install cylinder heads and gaskets; tighten according to manufacturer’s specifications and procedures.
07.13	Inspect and test valve springs for square-ness, pressure, and free height comparison; replace as needed.
07.14	Inspect valve spring retainers, locks, and valve grooves.

07.15	Replace valve stem seals.
07.16	Inspect valve guides for wear; check valve guide height and stem- to-guide clearance; determine necessary action.
07.17	Inspect valves; determine necessary action.
07.18	Inspect valve seats; determine necessary action.
07.19	Check valve face-to-seat contact and valve seat concentricity (run out); determine necessary action.
07.20	Check valve spring assembled height and valve stem height; service valve and spring assemblies as needed.
07.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); repair or replace.
07.22	Inspect hydraulic or mechanical lifters; replace as needed.
07.23	Adjust valves (mechanical or hydraulic lifters).
07.24	Inspect and replace camshaft drives (including gear wear and backlash, sprocket and chain wear, overhead cam drive sprockets, drive belts, belt tension, and tensioners).
07.25	Inspect camshaft for run out; measure journals and lobes for wear.
07.26	Inspect and measure camshaft bearings for wear, damage, out of round, and alignment; determine necessary action.
07.27	Verify camshaft(s) timing according to manufacturer’s specifications and procedure.
07.28	Service product specific cam drive systems.
07.29	Perform product specific valve adjustments.
07.30	Remove and replace valve cover gaskets.
Engine Block Diagnosis and Repair	
07.31	Inspect and replace pans, covers, gaskets, and seals.
07.32	Inspect engine block for cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed repairs.
07.33	Inspect internal and external threads; repair as needed.
07.34	Remove cylinder wall ridges.
07.35	Inspect and measure cylinder walls for damage and wear; determine necessary action.
07.36	Deglaze and clean cylinder walls.
07.37	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
07.38	Inspect crankshaft for surface cracks and journal damage; check oil passage condition; measure journal wear; determine necessary action.
07.39	Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selections of bearings).

07.40	Identify position and bearing wear patterns that include connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition.
07.41	Inspect, measure, service or replace pistons.
07.42	Inspect, measure, and install piston rings.
07.43	Inspect, repair or replace crankshaft vibration damper (harmonic balancer).
07.44	Inspect flywheel or flex-plate and ring gear for cracks and wear; measure run out; determine necessary action.
07.45	Inspect, remove, and replace crankshaft pilot bearing or bushing (as applicable).
07.46	Reassemble engine components using correct gaskets and sealants.
07.47	Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.
Lubrication and Cooling Systems Diagnosis and Repairs	
07.48	Prime engine lubrication system.
07.49	Perform oil pressure tests; determine necessary action.
07.50	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; replace as needed.
07.51	Perform cooling system tests (pressure, combustion leakage, and temperature); determine necessary action.
07.52	Inspect, replace, and adjust drive belts and pulleys.
07.53	Inspect and replace engine cooling and heater system hoses.
07.54	Inspect, test, and replace thermostat and housing.
07.55	Inspect coolant; drain, flush, and refill cooling system with recommended coolant and bleed air as required.
07.56	Inspect, test, remove, and replace water pump.
07.57	Inspect and test radiator, pressure cap, and coolant recovery system; remove and replace radiator.
07.58	Clean, inspect, and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.
07.59	Inspect and test electrical fan control system and circuits.
07.60	Inspect auxiliary oil coolers; replace as needed.
07.61	Inspect, test, and replace oil temperature and pressure switches and sensors.
07.62	Perform oil and filter change.
08.0	Demonstrate proficiency in the operation and servicing of automatic transmission/transaxle.-The student will be able to:
08.01	Interpret and verify driver’s complaint; verify proper engine operation; determine necessary action.
08.02	Diagnose unusual fluid usage, level, and condition problems; determine necessary action.
08.03	Perform pressure tests; determine necessary action.

08.04	Perform stall tests; determine necessary action.
08.05	Perform lock-up converter system tests; determine necessary action.
08.06	Diagnose electronic, mechanical, and vacuum control systems; determine necessary action.
08.07	Diagnose noise and vibration problems; determine necessary action.
Transmission and Transaxle Maintenance and Adjustment	
08.08	Inspect, adjust or replace manual shift valve and throttle (TV) linkages or cables and check gear select indicator (as applicable).
08.09	Service transmission; perform visual inspection; replace fluids and filters.
In-Vehicle Transmission and Transaxle Repair	
08.10	Inspect and replace external seals and gaskets.
08.11	Inspect extension housing; replace bushing and seals.
08.12	Inspect, leak test, flush, and replace cooler, lines, and fittings.
08.13	Inspect, measure, clean, and replace valve body (includes surfaces and bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets); check/adjust valve body bolt torque.
08.14	Inspect servo bore, piston, seals, pin, spring, and retainers; repair or replace as needed.
08.15	Inspect accumulator bore, piston, seals, spring, and retainer; repair or replace as needed.
08.16	Inspect, test, adjust, repair or replace transmission related electrical and electronic components (includes computers, solenoids, sensors, relays, switches, and harnesses).
08.17	Inspect, replace, and align power train mounts.
Off-Vehicle Transmission and Transaxle Repair (Removal, Disassembly, and Reinstallation)	
08.18	Remove and reinstall transmission/transaxle and torque converter.
08.19	Disassemble, clean, and inspect transmission/transaxle.
08.20	Assemble transmission/transaxle.
Oil Pump and Converter	
08.21	Inspect converter flex plate, attaching parts, pilot drive, pump drive, and seal areas.
08.22	Measure torque converter end play and check for interference check stator clutch.
08.23	Inspect, measure, and replace oil pump housings, shafts, vanes, rotors, gears, valves, seals, and bushings.
08.24	Check torque converter and transmission cooling system for contamination.
Gear Train, Shafts, Bushings and Case	
08.25	Check end play or preload; determine needed service.
08.26	Inspect, measure, and replace thrust washers and bearings.

08.27	Inspect oil delivery seal rings, ring grooves, and sealing surface areas.
08.28	Inspect bushings; replace as needed.
08.29	Inspect and measure planetary gear assembly (includes sun, ring gear, thrust washers, planetary gears, and carrier assembly); replace as needed.
08.30	Inspect cases, bores, passages, bushings, vents, and mating surfaces; replace as needed.
08.31	Inspect transaxle drive, link chains, sprockets, gears, bearings and bushings; replace as needed.
08.32	Inspect, measure, repair, adjust or replace transaxle final drive components.
08.33	Inspect and reinstall parking pawl, shaft, spring, and retainer; replace as needed.
Friction and Reaction Units	
08.34	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; replace as needed.
08.35	Measure clutch pack clearance; adjust as needed.
08.36	Air test operation of clutch and servo assemblies.
08.37	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers; replace as needed.
08.38	Inspect bands and drums; replace as needed.
09.0	Demonstrate proficiency in the operation and assembly of manual drive transmission/transaxle.-The student will be able to:
09.01	Diagnose clutch noise, binding, slippage, pulsation, and chatter problems; determine necessary action.
09.02	Inspect, adjust or replace clutch pedal linkage, automatic adjuster mechanisms, brackets, bushings, pivots, and springs.
09.03	Inspect, adjust, repair or replace hydraulic clutch slave master-cylinders, lines, and hoses.
09.04	Inspect, adjust or replace release (throw-out) bearing, lever, and pivot.
09.05	Inspect and replace clutch pressure plate assembly and clutch disc.
09.06	Inspect, remove or replace crankshaft pilot bearing or bushing (as applicable).
09.07	Inspect, repair, and service or replace flywheel and ring gear.
09.08	Inspect engine block, clutch (bell) housing, and transmission case mating surface; determine necessary action.
09.09	Measure flywheel-to-block run out and crankshaft end play; determine necessary action.
09.10	Measure clutch (bell) housing bore-to-crankshaft run out and face square-ness; determine needed service.
09.11	Inspect accumulator bore, piston, seals, spring, and retainer; repair or replace as needed.
Transmission Diagnosis and Repair	
09.12	Diagnose transmission noise, hard shifting, jumping out of gear, and fluid leakage problems; determine necessary action.
09.13	Inspect, adjust, and replace transmission shift linkages, brackets, bearings, cables, pivots, and levers.

09.14	Inspect, replace, and align power train mounts.
09.15	Inspect and replace transmission gaskets, seals, and sealants; Inspect sealing surfaces.
09.16	Remove and reinstall transmission.
09.17	Disassemble, clean, and reassemble transmission components.
09.18	Inspect, adjust, and reinstall transmission shift cover, forks, grommets, levers, shafts, sleeves, detent mechanisms, interlocks, and springs.
09.19	Inspect and reinstall input (clutch) shaft and bearings.
09.20	Inspect and reinstall main shaft, gears, thrust washers, bearings, and retainers.
09.21	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.
09.22	Inspect and reinstall counter (cluster) gear, shaft, bearings, thrust washers, and retainers; check end play; adjust as needed.
09.23	Inspect and reinstall reverse idler gear, shaft, bearings, thrust washers, and retainers; check end play; adjust as needed.
09.24	Inspect, repair, and replace extension housing and transmission case mating surfaces, bores, bushings, and vents.
09.25	Inspect lubrication devices (oil pump or slingers).
Transaxle Diagnosis and Repair	
09.26	Diagnose transaxle noise, hard shifting, jumping out of gear, and fluid leakage problem; determine necessary action.
09.27	Inspect, adjust, and reinstall transaxle shift linkages, brackets, bushings, cables, pivots, and levers.
09.28	Inspect and reinstall power train mounts.
09.29	Remove and reinstall transaxle.
09.30	Inspect and replace transaxle gaskets, seals, and sealants; inspect sealing surfaces.
09.31	Remove and replace transaxle final drive.
09.32	Disassemble and clean transaxle final drive.
09.33	Inspect, adjust, and reinstall transaxle shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.
09.34	Inspect and reinstall input (clutch) shaft and bearings.
09.35	Inspect and reinstall output shaft, gears, thrust washers, bearings, and retainers.
09.36	Measure end play or preload (shim or spacer selection procedure) on transaxle shafts; adjust as needed.
09.37	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.
09.38	Inspect and reinstall reverse idler gear, shaft, bearings, thrust washers, and retainers.
09.39	Inspect transaxle case, mating surfaces, bores, bushings, and vents.
09.40	Diagnose differential assembly noise and vibration problems; determine necessary action.

09.41	Remove, inspect, measure, adjust, and reinstall differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.
09.42	Inspect lubrication devices (oil pump or slingers).
Drive and Half Shaft Universal and Constant-Velocity (CV) Joint Diagnosis and Repair	
09.43	Diagnose constant-velocity (CV) joint noise and vibration problems; determine necessary action.
09.44	Diagnose universal joint noise and vibration problems; determine necessary action.
09.45	Diagnose front wheel drive (FWD) front wheel bearing noise and vibration problems; determine necessary action.
09.46	Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.
09.47	Inspect, service, and replace shaft center support bearings.
09.48	Check and correct shaft balance; measure shaft run out; measure and adjust driveline angles.
Rear Axle Diagnosis and Repair; Ring and Pinion Gears and Differential Case Assembly	
09.49	Diagnose noise and vibration problems; determine necessary action.
09.50	Diagnose fluid leakage problems; determine necessary action.
09.51	Inspect and replace companion flange and pinion seal; measure companion flange run out.
09.52	Inspect ring gear and measure run out; determine necessary action.
09.53	Remove and inspect drive pinion gear, spacers, sleeves, and bearings.
09.54	Measure and adjust drive pinion depth.
09.55	Measure and adjust drive pinion bearing preload.
09.56	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup and shim types).
09.57	Check ring and pinion tooth contact patterns; adjust as needed.
09.58	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.
09.59	Reassemble and reinstall differential case assembly; measure run out; determine necessary action.
Limited Slip Differential	
09.60	Diagnose noise, slippage, and chatter problems; determine necessary action.
09.61	Inspect and flush differential housing; refill with correct lubricant.
09.62	Inspect and reinstall clutch (cone or plate) components.
09.63	Measure rotating torque; determine necessary action.
09.64	Verify matching tires & tolerances.

Axle Shaft	
09.65	Diagnose rear axle shafts, bearings, and seals for noise, vibration, and fluid leakage problems; determine necessary action.
09.66	Inspect and replace rear axle shaft wheel studs.
09.67	Remove and replace rear axle shafts.
09.68	Inspect and replace rear axle shaft seals, bearings, and retainers.
09.69	Measure rear axle flange run out and shaft end play; determine necessary action.
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
09.70	Diagnose noise, vibration, and unusual steering problems; determine necessary action.
09.71	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
09.72	Remove and reinstall transfer case.
09.73	Disassemble, service, and reassemble transfer case and components.
09.74	Inspect, service, and replace front-wheel bearings and locking hubs.
09.75	Check drive assembly seals and vents; check lube level.
09.76	Inspect viscous coupling assembly.
09.77	Verify matching tires & tolerances.
10.0	Demonstrate proficiency in the operation of steering and suspension systems--The student will be able to:
10.01	Disable supplemental restraint system (SRS) in accordance with manufacturer's procedures.
10.02	Diagnose steering column noises, looseness, and binding problems (including tilt mechanisms); determine necessary action.
10.03	Diagnose power non-rack and pinion steering gear binding, uneven turning effort, looseness, hard steering, and fluid leakage problems; determine necessary action.
10.04	Diagnose power rack and pinion steering gear vibration, looseness, and hard steering problems; determine necessary action.
10.05	Inspect and replace steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel.
10.06	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
10.07	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
10.08	Inspect manual and power steering fluid levels and condition.
10.09	Flush, fill, and bleed power steering system.
10.10	Diagnose power steering fluid leakage; determine necessary action.
10.11	Inspect, replace, and adjust power steering pump belt.
10.12	Remove, inspect, and replace power steering pump, pump mounts, pump seals, and gaskets.

10.13	Remove, inspect, and replace power steering pump pulley; check alignment.
10.14	Perform power steering system pressure test; determine needed repairs.
10.15	Inspect and replace power steering hoses and fittings.
10.16	Inspect and replace pitman arm, relay (center-link/intermediate) rod, idler arm and mountings, and steering linkage damper.
10.17	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
10.18	Diagnose, inspect, adjust, repair or replace components of electronically-controlled steering systems.
10.19	Diagnose, inspect, repair or replace components of variable-assist steering systems.
10.20	Inspect electrical power assisted steering.
Suspension Systems Diagnosis and Repair; Front Suspensions	
10.21	Diagnose short and long arm suspension system noises, body sway, and uneven riding height problems; determine necessary action.
10.22	Diagnose MacPherson strut suspension system noises body sway, and uneven riding height problems; determine necessary action.
10.23	Remove, inspect, and replace upper and lower control arms, bushings, shafts, and rebound bumpers.
10.24	Remove, inspect, replace, and adjust strut (compression/tension) rods and bushings.
10.25	Remove, inspect, and replace upper and lower ball joints on short and long arm suspension systems.
10.26	Remove, inspect, and replace steering knuckle assemblies.
10.27	Remove, inspect, and replace short and long arm suspension system coil springs and spring insulators.
10.28	Remove, inspect, replace, and adjust suspension system torsion bars; inspect mounts.
10.29	Remove, inspect and replace stabilizer bar bushings, brackets, and links.
10.30	Remove, inspect, and replace ball joints on MacPherson strut suspension systems.
10.31	Remove, inspect, and replace MacPherson strut assembly, strut coil spring, insulators, and upper strut bearing mount.
10.32	Lubricate suspension and steering systems.
Rear Suspensions	
10.33	Remove, inspect, and replace coil springs and spring insulators.
10.34	Remove, inspect, and replace transverse links, control arms, bushings, and mounts.
10.35	Remove, inspect, and replace leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
10.36	Remove, inspect, and replace MacPherson strut assembly, strut coil spring, and insulators (silencers).
Miscellaneous Service	
10.37	Inspect, remove, and replace shock absorbers.

10.38	Remove, inspect, and service or replace front and rear wheel bearings.
10.39	Diagnose, inspect, adjust, repair or replace components of electronically-controlled suspension systems.
Wheel Alignment Diagnosis, Adjustment, and Repair	
10.40	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return problems; determine necessary action.
10.41	Measure vehicle riding height; determine necessary action.
10.42	Check and adjust front and rear wheel camber; determine needed repairs.
10.43	Check and adjust caster; determine necessary action.
10.44	Check and adjust front wheel toe; adjust as needed.
10.45	Center steering wheel.
10.46	Check toe-out-on-turns (turning radius); determine needed repairs.
10.47	Check SAI (steering axis inclination) and included angle; determine necessary action.
10.48	Check and adjust rear wheel toe.
10.49	Check rear wheel thrust angle; determine necessary action.
10.50	Check for front wheel setback; determine necessary action.
10.51	Check front cradle (sub-frame) alignment; determine needed repairs.
10.52	Reset steering angle sensor.
Wheel and Tire Diagnosis and Repair	
10.53	Inspect tires, diagnose tire wear patterns; check and adjust air pressure.
10.54	Diagnose wheel/tire vibration, shimmy, and noise problems; determine necessary action.
10.55	Rotate tires according to manufacturer’s recommendations.
10.56	Measure wheel, tire, axle, and hub run out; determine needed repairs.
10.57	Diagnose tire pull (lead) problem; determine corrective actions.
10.58	Balance wheel and tire assembly (static and dynamic).
10.59	Dismount, inspect, repair, and remount tire on wheel.
10.60	Reinstall wheel; torque lug nuts.
10.61	Identify and test pressure monitoring system (indirect and direct) for operation; calibrate system, verify operation of instrument panel lamps.
10.62	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.
11.0	Demonstrate proficiency in the operation and servicing of automotive brake system.-The student will be able to:

11.01	Measure brake pedal height, travel, and free play; determine necessary action.
11.02	Check master cylinder for internal and external leaks and proper operation; determine necessary action.
11.03	Remove, bench bleed, and replace master cylinder.
11.04	Diagnose poor stopping, pulling or dragging caused by problems in the hydraulic system; determine necessary action.
11.05	Inspect brake lines and fittings for leaks, dents, kinks, rust, cracks or wear; tighten loose fittings and supports.
11.06	Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; tighten loose fittings and supports.
11.07	Fabricate and install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed.
11.08	Select, handle, store, and install brake fluids to proper level.
11.09	Inspect, test, and replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.
11.10	Inspect, test, replace, and adjust height (load) sensing proportioning valve.
11.11	Inspect, test, and replace components of brake warning light system.
11.12	Bleed (manual, pressure, vacuum or surge) brake system; flush hydraulic system.
Drum Brake Diagnosis and Repair	
11.13	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation problems; determine necessary action.
11.14	Remove, clean (using proper safety procedures), inspect, and measure brake drums; service or replace as needed.
11.15	Mount brake drum on lathe machine braking surface.
11.16	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
11.17	Remove and reinstall wheel cylinders.
11.18	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
11.19	Reinstall wheel, torque lug nuts, and make final checks and adjustments.
Disc Brake Diagnosis and Repair	
11.20	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation caused problems; determine necessary action.
11.21	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing.
11.22	Clean and inspect caliper mounting and slides for wear and damage.
11.23	Remove, clean, and inspect pads and retaining hardware; determine needed service.
11.24	Reassemble, lubricate, and reinstall caliper, pads, and related hardware.
11.25	Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer’s recommendations in determining need to machine or replace.
11.26	Refinish rotor according to manufacturer’s recommendations.

11.27	Adjust calipers with integrated parking brake system.
11.28	Fill master cylinder with recommended fluid and seat pads; inspect caliper for leaks.
11.29	Reinstall wheel, torque lug nuts, and make final checks and adjustments.
11.30	Remove and replace rotor.
Power Assist Units Diagnosis and Repair	
11.31	Test pedal free travel with and without engine running; check power assist operation.
11.32	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
11.33	Inspect hydro and/or vacuum-type power booster unit for proper operation; repair or replace parts as needed.
Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair	
11.34	Diagnose wheel bearing noises, wheel shimmy, and vibration problems; determine necessary action.
11.35	Remove, clean, inspect, repack, and reinstall wheel bearings and replace seals; reinstall hub and adjust wheel bearings.
11.36	Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, and replace as needed.
11.37	Check parking brake operation; adjust as needed.
11.38	Check operation of parking brake indicator light system.
11.39	Check operation of brake stop light system; adjust and service as needed.
11.40	Replace wheel bearing and race.
Electronic Brake, Traction, and Stability Control Systems Diagnosis and Repair	
11.41	Inspect, test, and service anti-lock brake system (ABS) hydraulic, electrical, and mechanical components.
11.42	Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise problems caused by the anti-lock brake system (ABS); determine necessary action.
11.43	Observe anti-lock brake system (ABS) warning light(s) at startup; determine if further diagnosis is needed.
11.44	Diagnose anti-lock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action.
11.45	Depressurize high pressure components of the anti-lock brake system (ABS) following manufacturer's recommended safety procedures.
11.46	Fill the anti-lock brake system (ABS) master cylinder with recommended fluid following manufacturer's procedures; inspect system for leaks.
11.47	Bleed the anti-lock brake system's (ABS) front and rear hydraulic circuits following manufacturer's procedures.
11.48	Remove and install anti-lock brake system (ABS) electrical/electronic/hydraulic components following manufacturer's procedures and specifications.
11.49	Service, test, and adjust anti-lock brake system (ABS) speed sensors following manufacturer's recommended procedures.

11.50	Diagnose anti-lock brake system (ABS) braking problems caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
11.51	Identify and inspect electronic brake control systems; determine necessary action.
11.52	Identify traction control and vehicle stability control systems components.
11.53	Describe the operation of a regenerative braking system.
12.0	Demonstrate proficiency in diagnosing/troubleshooting electrical/electronic related components.-The student will be able to:
12.01	Use wiring diagrams during diagnosis of electrical circuit problems.
12.02	Check electrical circuits with a test light; determine necessary action.
12.03	Check voltage and voltage drop in electrical/electronic circuits using a digital multi-meter (DMM); determine needed repairs.
12.04	Check current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.
12.05	Check electrical circuits using jumper wires; determine necessary action.
12.06	Find shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
12.07	Measure and diagnose the cause(s) of abnormal key-off battery drain, parasitic draw; determine necessary action.
12.08	Inspect and test fusible links, circuit breakers, and fuses; replace as needed.
12.09	Inspect and test switches, connectors, relays, and wires of electrical/electronic circuits; repair or replace as needed.
Battery Diagnosis and Service	
12.10	Perform battery state-of-charge test; determine needed service.
12.11	Perform battery capacity and conductance (load, high-rate discharge) test; determine needed service.
12.12	Maintain or restore electronic memory functions.
12.13	Inspect, clean, and replace battery.
12.14	Perform slow/fast battery charge.
12.15	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.
12.16	Start a vehicle using jumper cables using a battery auxiliary power supply.
12.17	Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
12.18	Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
Starting System Diagnosis and Repair	
12.19	Perform starter current draw and circuit voltage drop test; determine necessary action.
12.20	Inspect and test starter relays and solenoids; replace as needed.
12.21	Remove and replace/reinstall starter.

12.22 Perform starter bench tests; determine necessary action.
12.23 Inspect, test, and repair or replace switches, connectors, and wires of starter control circuits.
12.24 Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
Charging System Diagnosis and Repair
12.25 Diagnose charging system problems that cause an undercharge, a no-charge or an overcharge condition.
12.26 Inspect and adjust alternator drive belts; replace as needed.
12.27 Remove, inspect, and replace/reinstall alternator.
12.28 Perform charging circuit voltage drop tests; determine needed repairs.
Lighting Systems Diagnosis and Repair
12.29 Diagnose brighter than normal, intermittent, dim or no light operation.
12.30 Inspect, replace, and aim headlights and bulbs.
12.31 Inspect and diagnose incorrect turn signal or hazard light operation; repair or replace as needed.
12.32 Identify system voltage and safety precautions associated with high-intensity discharge headlights.
Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair
12.33 Diagnose intermediate, high, low or no gauge readings.
12.34 Inspect and test gauges and gauge sending units; replace as needed.
12.35 Inspect and test connectors, wires, and printed circuit boards of gauge circuits; repair or replace as needed.
12.36 Diagnose incorrect operation of warning devices and other driver information systems.
12.37 Diagnose intermediate, high, low or no readings on electronic instrument clusters.
12.38 Inspect and test sensors, sending units, connectors, and wires of electronic instrument circuits; repair or replace as needed.
Horn and Wiper/Washer Diagnosis and Repair
12.39 Diagnose incorrect horn operation; repair as needed.
12.40 Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; repair as needed.
12.41 Diagnose incorrect windshield washer operation; repair as needed.
Accessories Diagnosis and Repair
12.42 Diagnose incorrect operation of motor-driven accessory circuits; repair as needed.
12.43 Diagnose incorrect heated glass operation; repair as needed.
12.44 Diagnose incorrect electric door and hatch/trunk lock operation; repair as needed.
12.45 Diagnose incorrect operation of cruise control systems; repair as needed.

12.46	Diagnose supplemental restraint system (SRS) problems; repair as needed. (NOTE: Follow manufacturer's safety procedures to prevent accidental deployment.)
12.47	Diagnose radio static and weak, intermittent, or no radio reception.
12.48	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.
12.49	Remove and reinstall door panel.
12.50	Describe the process for software transfers, software updates, or flash reprogramming on electrical modules.
13.0	Demonstrate proficiency in heating, air conditioning and engine cooling systems.-The student will be able to:
13.01	Diagnose unusual operating noises in the A/C system; determine necessary action.
13.02	Conduct a performance test of the A/C system; determine needed repairs.
13.03	Leak test a/c system; determine necessary action.
13.04	Inspect the condition of discharged oil.
13.05	Select oil type; measure and add oil to the A/C system as needed.
13.06	Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
Refrigeration System Component Diagnosis and Repair Compressor and Clutch	
13.07	Diagnose A/C system problems that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.
13.08	Inspect A/C compressor drive belts; replace as needed.
13.09	Inspect, test, and replace A/C compressor clutch components or assembly.
13.10	Remove and replace A/C compressor and mountings.
13.11	Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.
Evaporator, Receiver/Drier, Condenser, Etc.	
13.12	Diagnose A/C system problems caused by too much moisture in the refrigerant; determine necessary action.
13.13	Install A/C system filter.
13.14	Remove and inspect A/C system mufflers, hoses, lines, fittings, o-rings, seals, and service valves; replace as needed.
13.15	Inspect A/C condenser for air flow restrictions; service as required.
13.16	Inspect receiver/drier or accumulator/drier; replace as needed.
13.17	Inspect and test expansion valve or orifice (expansion) tube; replace as needed.
13.18	Inspect evaporator housing water drain; repair as needed.
Heating and Engine Cooling Systems Diagnosis and Repair	
13.19	Diagnose temperature control problems in the heater/ventilation system; determine necessary action.

13.20	Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.
13.21	Inspect engine cooling and heater system hoses and belts; replace as needed.
13.22	Inspect, test, and replace thermostat and housing.
13.23	Determine coolant condition; drain and recover.
13.24	Flush system and refill with recommended coolant; bleed system.
13.25	Clean, inspect, and test fan, fan clutch (electrical and mechanical), fan shroud, and air dams; replace as needed.
13.26	Inspect and test heater control valve(s); replace as needed.
Operating Systems and Related Controls Diagnosis and Repairs	
13.27	Diagnose failures in the electrical controls of heating and A/C systems; determine necessary action.
13.28	Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; repair as needed.
13.29	Test A/C compressor load cut-off systems; determine needed repairs.
13.30	Using a scan tool, observe and record related HVAC data and trouble codes.
Vacuum/Mechanical	
13.31	Diagnose failure in the vacuum and mechanical controls of the heating and A/C system; determine necessary action.
13.32	Inspect and test A/C-heater control panel assembly; replace as needed.
13.33	Inspect and test A/C-heater control cables and linkages adjust or replace as needed.
13.34	Inspect and test A/C-heater vacuum control switches, hoses, diaphragms (motor), vacuum reservoir, check valve, and restrictors; replace as needed.
13.35	Inspect and test A/C-heater ducts, doors, hoses, and outlets; replace as needed.
Automatic and Semi-Automatic Temperature Controls	
13.36	Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.
Refrigerant Recovery, Recycling, and Handling	
13.37	Verify correct operation and maintenance of refrigerant handling equipment.
13.38	Identify and recover A/C system refrigerant.
13.39	Recycle refrigerant.
13.40	Label and store refrigerant.
13.41	Evaluate and charge A/C system.
14.0	Demonstrate proficiency in engine performance services.-The student will be able to:

14.01	Interpret and verify complaint; determine necessary action.
14.02	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
14.03	Diagnose unusual engine noise or vibration problems; determine necessary action.
14.04	Diagnose unusual exhaust color, odor, and sound; determine needed action.
14.05	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
14.06	Perform cylinder power balance test; determine needed action.
14.07	Perform cylinder compression test; determine needed action.
14.08	Perform cylinder leakage test; determine needed action.
14.09	Diagnose engine mechanical, electrical, electronic, fuel and ignition problems with an oscilloscope and engine diagnostic equipment; determine needed action.
Computerized Engine Controls Diagnosis and Repair	
14.10	Diagnose emissions or drive-ability problems resulting from of computerized engine controls with no diagnostic trouble codes stored; determine necessary action.
14.11	Retrieve and record stored diagnostic trouble codes.
14.12	Diagnose the causes of emissions or drive-ability problems resulting from failure of computerized engine controls with stored diagnostic trouble codes.
14.13	Inspect, test, adjust, and replace computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits.
14.14	Obtain and interpret digital multi-meter (DMM) readings.
14.15	Access and use electronic service information (ESI).
14.16	Locate and interpret vehicle and major component identification number (VIN, vehicle certification labels and calibration decals).
14.17	Inspect and test power and ground circuits and connections; service or replace as needed.
14.18	Practice recommended precautions when handling static sensitive devices.
14.19	Diagnose drive-ability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, torque controls, suspension controls, traction controls, torque management, A/C, automatic transmissions, and similar systems); determine necessary action.
14.20	Update diagnostic scanner.
14.21	Perform product specific OBD II drive cycle diagnostic tests.
Ignition System Diagnosis and Repair	
14.22	Diagnose no-starting, drive-ability, and emissions problems on vehicles with electronic ignition (distributor-less) systems; determine necessary action.
14.23	Diagnose no-starting, drive-ability, and emissions problems on vehicles with distributor ignition (DI) systems; determine needed repairs.
14.24	Inspect and test ignition primary circuit wiring and components; repair or replace as needed.

14.25	Inspect and test ignition system secondary circuit wiring and components; replace as needed.
14.26	Inspect and test ignition coil(s); replace as needed.
14.27	Inspect and test ignition wiring harness and connectors; replace as needed.
14.28	Inspect and test ignition system pick-up sensors or triggering devices including crankshaft and camshaft sensors; replace as needed.
14.29	Inspect, test, and/or replace ignition control module and powertrain/engine control module; reprogram as needed.
14.30	Service product specific ignition systems.
14.31	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair	
14.32	Diagnose hot or cold no-starting, hard starting, poor drive-ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel system; determine needed action.
14.33	Inspect fuel tank and fuel cap; inspect and replace fuel lines, fittings, and hoses.
14.34	Check fuel for contaminants and quality.
14.35	Inspect and test fuel pumps and pump control systems; replace as needed.
14.36	Replace fuel filters.
14.37	Inspect and test fuel pressure regulation system and components.
14.38	Remove, clean, and reinstall throttle body; adjust related linkages
14.39	Inspect and test fuel injectors; clean and replace.
14.40	Inspect throttle body mounting plates, air induction and filtration system, intake manifold, and gaskets; clean or replace as needed.
14.41	Remove, inspect, and test vacuum and electrical components and connections of fuel system; repair or replace as needed.
14.42	Inspect exhaust manifold, exhaust pipes, mufflers, resonators, tail pipes, and heat shields; repair or replace as needed.
14.43	Perform exhaust system back-pressure test; determine needed action.
14.44	Test the operation of turbocharger/supercharger systems; determine needed action.
14.45	Remove, clean, inspect, and repair or replace turbocharger/supercharger system components.
14.46	Identify the causes of turbocharger/supercharger failure; determine needed action.
14.47	Inspect and test catalytic converter efficiency.
14.48	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.
14.49	Check and refill diesel exhaust fluid (DEF).
Emissions Control Systems Diagnosis and Repair Positive Crankcase Ventilation	
14.50	Diagnose oil leaks, emissions, and drive-ability problems resulting from failure of the positive crankcase ventilation (PCV) system.

14.51	Inspect and test positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.
Exhaust Gas Recirculation	
14.52	Diagnose emissions and drive-ability problems caused by failure of the exhaust gas recirculation (EGR) system.
14.53	Inspect and test valve, valve manifold, and exhaust passages of exhaust gas recirculation (EGR) systems; service or replace as needed.
14.54	Inspect and test vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; service or replace as needed.
14.55	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; repair or replace as needed.
Exhaust Gas Treatment	
14.56	Diagnose emissions and drive-ability problems resulting from failure of the secondary air injection and catalytic converter systems.
14.57	Inspect and test mechanical components of secondary air injection systems; service or replace as needed.
14.58	Inspect and test electrical/electronically-operated components and circuits of air injection systems; replace as needed.
14.59	Inspect and test components of catalytic converter systems; replace as needed.
Evaporative Emissions Controls	
14.60	Diagnose emissions and drive-ability problems resulting from failure of evaporative emissions control system.
14.61	Inspect and test components and hoses of evaporative emissions control system; replace as needed.
Engine Related Service	
14.62	Adjust valves on engines with mechanical or hydraulic lifters.
14.63	Verify correct camshaft timing; determine needed action.
14.64	Verify engine operating temperature; determine needed action.
14.65	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; service or replace as needed.
14.66	Inspect and test thermostat, by-pass, and housing; replace as needed.
14.67	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; service or replace as needed.

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

The purpose of this program is to prepare students for employment and/or specialized training in the automotive industry. The program provides specialized corporate/association job preparatory training.

Automotive Technology Programs sponsored by automobile manufacturers require an internship at a dealership.

The program must be NATEF Master Certified and have a business plan approved by the appropriate industry affiliated organization. Instructors must be ASE Certified in all areas that they teach in addition to being certified in Engine Performance and Electrical/Electronic Systems. ASE Master Technician and Advanced Engine Performance (L1) ASE Certification is preferred. Instructors must meet the specific product certification as specified in the business plan.

Program must meet the equipment and specialty tool requirement as specified in the business plan. Must offer Federally recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization 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 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: **Dealer Service Technician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060419
Program Type	College Credit
Standard Length	27 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics

Purpose

This certificate program is part of the Manufacture-Specific Automotive Service Technology AAS degree program (0647060407).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to instruction in diagnosis of malfunctions in the repair of electrical, brake systems, steering and suspension systems; troubleshooting skills; and servicing, maintaining and repairing all mechanical systems on gasoline automobiles including electrical, brake, suspension and related systems. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive Service industry; technical and product skills, underlying principles of technology, and health, safety, and environmental issues.

The content includes but is not limited to a written business plan that establishes a partnership agreement between the educational institution and the automotive industry.

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

Standards

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

01.0 Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.
02.0 Demonstrate proficiency in appropriate math skills.
03.0 Demonstrate proficiency in appropriate understanding of basic sciences.
04.0 Demonstrate proficiency in employability skills.
05.0 Demonstrate proficiency in appropriate communication skills.
06.0 Demonstrate proficiency in acceptable employee behavior in the automotive industry.
07.0 Demonstrate proficiency in engine theory and repairs.
08.0 Demonstrate proficiency in the operation of steering and suspension systems.
09.0 Demonstrate proficiency in the operation and servicing of automotive brake systems.
10.0 Demonstrate proficiency in diagnosing/troubleshooting electrical/electronic components as related to power train.

Florida Department of Education
Student Performance Standards

Program Title: **Dealer Service Technician**
CIP Numbers: **0647060419**
Program Length: **27 credit hours**
SOC Code(s): **49-3023**

This certificate program is part of the Dealer-Specific Automotive Technology / New Name 2017-2018, Manufacture-Specific Automotive Service Technology AAS degree program (0647060407). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the equipment skills and safety regulations relating to the automotive industry.-The student will be able to:
01.01	Apply shop safety rules, EPA and OSHA standards.
01.02	Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
01.03	Identify and initiate appropriate emergency response procedures.
01.04	Identify, use and maintain hand and power tools properly.
01.05	Identify and use proper placement of floor jacks and jack stands.
01.06	Identify and practice using appropriate precision measuring tools and torque methods.
01.07	Identify and describe the proper procedure to apply and remove automotive fasteners, to include thread repair.
01.08	Identify and use metric and English measurement skills.
01.09	Use computer and operate keyboard.
01.10	Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.
01.11	Identify and describe typical automotive lubricants and lubricant properties.
01.12	Interpret the Federal Law as recorded in (29 CFR-1910.1200).
01.13	Identify and describe typical automotive seals and gaskets.
01.14	Utilize flat rate manuals, service manuals, service bulletins, parts manuals and electronic service information.
01.15	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
01.16	Demonstrate knowledge of applicable certifications.
01.17	Describe and identify supplemental restraint systems (SRS).
01.18	Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.
02.0	Demonstrate proficiency in appropriate math skills.-The student will be able to:
02.01	Read and interpret measuring devices.

02.02	Solve number word problems.
02.03	Solve percentage problems.
02.04	Operate a calculator.
02.05	Use metric units related to auto industry.
02.06	Convert inches to millimeters and millimeters to inches.
02.07	Solve problems of length, area, volume and weight to include the circumference of a circle, the area of a rectangle, and the volume of a cylinder.
02.08	Measure size within a specified tolerance.
02.09	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
02.10	Identify various types of gears and interpret the meaning of a gear ratio number.
03.0	Demonstrate proficiency in appropriate understanding of basic sciences.-The student will be able to:
03.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
03.02	Draw conclusions or make inferences from data.
03.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
03.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
04.0	Demonstrate proficiency in employability skills.-The student will be able to:
04.01	Identify employment requirements for an automotive career.
04.02	Identify documents, which may be required when applying for a job.
04.03	Complete a job application form correctly.
04.04	Identify and adopt acceptable work habits.
04.05	Identify acceptable employee health habits; including infection control of blood borne pathogens.
04.06	Demonstrate appropriate telephone/communication skills.
04.07	Conduct a job search.
04.08	Demonstrate competence in job interview techniques.
04.09	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
04.10	Demonstrate knowledge of how to make job changes appropriately.
04.11	Describe the Federal Law as recorded in (29 CFR-1910.1200).
05.0	Demonstrate proficiency in appropriate communication skills.-The student will be able to:
05.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and

	industry.
05.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
05.03	Read and follow written and oral instructions.
05.04	Answer and ask questions coherently and concisely.
05.05	Identify and use critical thinking methodologies and techniques.
06.0	Demonstrate proficiency in acceptable employee behavior in the automotive industry.-The student will be able to:
06.01	Explain the effects of chemical/substance abuse.
06.02	Identify principles of stress management.
06.03	Identify and define career opportunities in the automotive service industry.
06.04	Demonstrate acceptable industry dress code.
06.05	Identify and demonstrate proper customer relations skills.
06.06	Identify principles of time management.
06.07	Identify acceptable customer relations.
07.0	Demonstrate proficiency in engine theory and repair.-The student will be able to:
07.01	Interpret and verify complaint; determine necessary action.
07.02	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
07.03	Listen to engine noises; determine necessary action.
07.04	Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action.
07.05	Perform engine vacuum tests; determine necessary action.
07.06	Perform cylinder power balance tests; determine necessary action.
07.07	Perform cylinder compression tests; determine necessary action.
07.08	Perform cylinder leakage tests; determine necessary action.
07.09	Remove and re-install engine.
07.10	Identify hybrid vehicle internal combustion engine service precautions.
Cylinder Head and Valve Train Diagnosis and Repair	
07.11	Remove cylinder head(s); inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition.
07.12	Install cylinder heads and gaskets; tighten according to manufacturer’s specifications and procedures.
07.13	Inspect and test valve springs for square-ness, pressure, and free height comparison; replace as needed.

07.14	Inspect valve spring retainers, locks, and valve grooves.
07.15	Replace valve stem seals.
07.16	Inspect valve guides for wear; check valve guide height and stem- to-guide clearance; determine necessary action.
07.17	Inspect valves; determine necessary action.
07.18	Inspect valve seats; determine necessary action.
07.19	Check valve face-to-seat contact and valve seat concentricity (run out); determine necessary action.
07.20	Check valve spring assembled height and valve stem height; service valve and spring assemblies as needed.
07.21	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); repair or replace.
07.22	Inspect hydraulic or mechanical lifters; replace as needed.
07.23	Adjust valves (mechanical or hydraulic lifters).
07.24	Inspect and replace camshaft drives (including gear wear and backlash, sprocket and chain wear, overhead cam drive sprockets, drive belts, belt tension, and tensioners).
07.25	Inspect camshaft for run out; measure journals and lobes for wear.
07.26	Inspect and measure camshaft bearings for wear, damage, out of round, and alignment; determine necessary action.
07.27	Verify camshaft(s) timing according to manufacturer’s specifications and procedure.
07.28	Service product specific cam drive systems.
07.29	Perform product specific valve adjustments.
07.30	Remove and replace valve cover gaskets.
Engine Block Diagnosis and Repair	
07.31	Inspect and replace pans, covers, gaskets, and seals.
07.32	Inspect engine block for cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed repairs.
07.33	Inspect internal and external threads; repair as needed.
07.34	Remove cylinder wall ridges.
07.35	Inspect and measure cylinder walls for damage and wear; determine necessary action.
07.36	Deglaze and clean cylinder walls.
07.37	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
07.38	Inspect crankshaft for surface cracks and journal damage; check oil passage condition; measure journal wear; determine necessary action.
07.39	Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selections of bearings).

07.40	Identify position and bearing wear patterns that include connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition.
07.41	Inspect, measure, service or replace pistons.
07.42	Inspect, measure, and install piston rings.
07.43	Inspect, repair or replace crankshaft vibration damper (harmonic balancer).
07.44	Inspect flywheel or flex-plate and ring gear for cracks and wear; measure run out; determine necessary action.
07.45	Inspect, remove, and replace crankshaft pilot bearing or bushing (as applicable).
07.46	Reassemble engine components using correct gaskets and sealants.
07.47	Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.
Lubrication and Cooling Systems Diagnosis and Repairs	
07.48	Prime engine lubrication system.
07.49	Perform oil pressure tests; determine necessary action.
07.50	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; replace as needed.
07.51	Perform cooling system tests (pressure, combustion leakage, and temperature); determine necessary action.
07.52	Inspect, replace, and adjust drive belts and pulleys.
07.53	Inspect and replace engine cooling and heater system hoses.
07.54	Inspect, test, and replace thermostat and housing.
07.55	Inspect coolant; drain, flush, and refill cooling system with recommended coolant and bleed air as required.
07.56	Inspect, test, remove, and replace water pump.
07.57	Inspect and test radiator, pressure cap, and coolant recovery system; remove and replace radiator.
07.58	Clean, inspect, and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.
07.59	Inspect and test electrical fan control system and circuits.
07.60	Inspect auxiliary oil coolers; replace as needed.
07.61	Inspect, test, and replace oil temperature and pressure switches and sensors.
07.62	Perform oil and filter change.
08.0	Demonstrate proficiency in the operation of steering and suspension systems.-The student will be able to:
08.01	Disable supplemental restraint system (SRS) in accordance with manufacturer’s procedures.
08.02	Diagnose steering column noises, looseness, and binding problems (including tilt mechanisms); determine necessary action.
08.03	Diagnose power non-rack and pinion steering gear binding, uneven turning effort, looseness, hard steering, and fluid leakage

	problems; determine necessary action.
08.04	Diagnose power rack and pinion steering gear vibration, looseness, and hard steering problems; determine necessary action.
08.05	Inspect and replace steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel.
08.06	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
08.07	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
08.08	Inspect manual and power steering fluid levels and condition.
08.09	Flush, fill, and bleed power steering system.
08.10	Diagnose power steering fluid leakage; determine necessary action.
08.11	Inspect, replace, and adjust power steering pump belt.
08.12	Remove, inspect, and replace power steering pump, pump mounts, pump seals, and gaskets.
08.13	Remove, inspect, and replace power steering pump pulley; check alignment.
08.14	Perform power steering system pressure test; determine needed repairs.
08.15	Inspect and replace power steering hoses and fittings.
08.16	Inspect and replace pitman arm, relay (center-link/intermediate) rod, idler arm and mountings, and steering linkage damper.
08.17	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
08.18	Diagnose, inspect, adjust, repair or replace components of electronically-controlled steering systems.
08.19	Diagnose, inspect, repair or replace components of variable-assist steering systems.
08.20	Inspect electrical power assisted steering.
Suspension Systems Diagnosis and Repair; Front Suspensions	
08.21	Diagnose short and long arm suspension system noises, body sway, and uneven riding height problems; determine necessary action.
08.22	Diagnose MacPherson strut suspension system noises body sway, and uneven riding height problems; determine necessary action.
08.23	Remove, inspect, and replace upper and lower control arms, bushings, shafts, and rebound bumpers.
08.24	Remove, inspect, replace, and adjust strut (compression/tension) rods and bushings.
08.25	Remove, inspect, and replace upper and lower ball joints on short and long arm suspension systems.
08.26	Remove, inspect, and replace steering knuckle assemblies.
08.27	Remove, inspect, and replace short and long arm suspension system coil springs and spring insulators.
08.28	Remove, inspect, replace, and adjust suspension system torsion bars; inspect mounts.

08.29	Remove, inspect and replace stabilizer bar bushings, brackets, and links.
08.30	Remove, inspect, and replace ball joints on MacPherson strut suspension systems.
08.31	Remove, inspect, and replace MacPherson strut assembly, strut coil spring, insulators, and upper strut bearing mount.
08.32	Lubricate suspension and steering systems.
Rear Suspensions	
08.33	Remove, inspect, and replace coil springs and spring insulators.
08.34	Remove, inspect, and replace transverse links, control arms, bushings, and mounts.
08.35	Remove, inspect, and replace leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
08.36	Remove, inspect, and replace MacPherson strut assembly, strut coil spring, and insulators (silencers).
Miscellaneous Service	
08.37	Inspect, remove, and replace shock absorbers.
08.38	Remove, inspect, and service or replace front and rear wheel bearings.
08.39	Diagnose, inspect, adjust, repair or replace components of electronically-controlled suspension systems.
Wheel Alignment Diagnosis, Adjustment, and Repair	
08.40	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return problems; determine necessary action.
08.41	Measure vehicle riding height; determine necessary action.
08.42	Check and adjust front and rear wheel camber; determine needed repairs.
08.43	Check and adjust caster; determine necessary action.
08.44	Check and adjust front wheel toe; adjust as needed.
08.45	Center steering wheel.
08.46	Check toe-out-on-turns (turning radius); determine needed repairs.
08.47	Check SAI (steering axis inclination) and included angle; determine necessary action.
08.48	Check and adjust rear wheel toe.
08.49	Check rear wheel thrust angle; determine necessary action.
08.50	Check for front wheel setback; determine necessary action.
08.51	Check front cradle (sub-frame) alignment; determine needed repairs.
08.52	Reset steering angle sensor.
Wheel and Tire Diagnosis and Repair	

08.53	Inspect tires, diagnose tire wear patterns; check and adjust air pressure.
08.54	Diagnose wheel/tire vibration, shimmy, and noise problems; determine necessary action.
08.55	Rotate tires according to manufacturer's recommendations.
08.56	Measure wheel, tire, axle, and hub run out; determine needed repairs.
08.57	Diagnose tire pull (lead) problem; determine corrective actions.
08.58	Balance wheel and tire assembly (static and dynamic).
08.59	Dismount, inspect, repair, and remount tire on wheel.
08.60	Reinstall wheel; torque lug nuts.
08.61	Identify and test pressure monitoring system (indirect and direct) for operation; calibrate system, verify operation of instrument panel lamps.
08.62	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.
09.0	Demonstrate proficiency in the operation and servicing of automotive brake system.-The student will be able to:
09.01	Measure brake pedal height, travel, and free play; determine necessary action.
09.02	Check master cylinder for internal and external leaks and proper operation; determine necessary action.
09.03	Remove, bench bleed, and replace master cylinder.
09.04	Diagnose poor stopping, pulling or dragging caused by problems in the hydraulic system; determine necessary action.
09.05	Inspect brake lines and fittings for leaks, dents, kinks, rust, cracks or wear; tighten loose fittings and supports.
09.06	Inspect flexible brake hoses for leaks, kinks, cracks, bulging or wear; tighten loose fittings and supports.
09.07	Fabricate and install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed.
09.08	Select, handle, store, and install brake fluids to proper level.
09.09	Inspect, test, and replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.
09.10	Inspect, test, replace, and adjust height (load) sensing proportioning valve.
09.11	Inspect, test, and replace components of brake warning light system.
09.12	Bleed (manual, pressure, vacuum or surge) brake system; flush hydraulic system.
Drum Brake Diagnosis and Repair	
09.13	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation problems; determine necessary action.
09.14	Remove, clean (using proper safety procedures), inspect, and measure brake drums; service or replace as needed.
09.15	Mount brake drum on lathe machine braking surface.
09.16	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.

09.17	Remove and reinstall wheel cylinders.
09.18	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
09.19	Reinstall wheel, torque lug nuts, and make final checks and adjustments.
Disc Brake Diagnosis and Repair	
09.20	Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation caused problems; determine necessary action.
09.21	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing.
09.22	Clean and inspect caliper mounting and slides for wear and damage.
09.23	Remove, clean, and inspect pads and retaining hardware; determine needed service.
09.24	Reassemble, lubricate, and reinstall caliper, pads, and related hardware.
09.25	Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace.
09.26	Refinish rotor according to manufacturer's recommendations.
09.27	Adjust calipers with integrated parking brake system.
09.28	Fill master cylinder with recommended fluid and seat pads; inspect caliper for leaks.
09.29	Reinstall wheel, torque lug nuts, and make final checks and adjustments.
09.30	Remove and replace rotor.
Power Assist Units Diagnosis and Repair	
09.31	Test pedal free travel with and without engine running; check power assist operation.
09.32	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
09.33	Inspect hydro and/or vacuum-type power booster unit for proper operation; repair or replace parts as needed.
Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair	
09.34	Diagnose wheel bearing noises, wheel shimmy, and vibration problems; determine necessary action.
09.35	Remove, clean, inspect, repack, and reinstall wheel bearings and replace seals; reinstall hub and adjust wheel bearings.
09.36	Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, and replace as needed.
09.37	Check parking brake operation; adjust as needed.
09.38	Check operation of parking brake indicator light system.
09.39	Check operation of brake stop light system; adjust and service as needed.
09.40	Replace wheel bearing and race.
Electronic Brake, Traction, and Stability Control Systems Diagnosis and Repair	

09.41	Inspect, test, and service anti-lock brake system (ABS) hydraulic, electrical, and mechanical components.
09.42	Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise problems caused by the anti-lock brake system (ABS); determine necessary action.
09.43	Observe anti-lock brake system (ABS) warning light(s) at startup; determine if further diagnosis is needed.
09.44	Diagnose anti-lock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action.
09.45	Depressurize high pressure components of the anti-lock brake system (ABS) following manufacturer's recommended safety procedures.
09.46	Fill the anti-lock brake system (ABS) master cylinder with recommended fluid following manufacturer's procedures; inspect system for leaks.
09.47	Bleed the anti-lock brake system's (ABS) front and rear hydraulic circuits following manufacturer's procedures.
09.48	Remove and install anti-lock brake system (ABS) electrical/electronic/hydraulic components following manufacturer's procedures and specifications.
09.49	Service, test, and adjust anti-lock brake system (ABS) speed sensors following manufacturer's recommended procedures.
09.50	Diagnose anti-lock brake system (ABS) braking problems caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
09.51	Identify and inspect electronic brake control systems; determine necessary action.
09.52	Identify traction control and vehicle stability control systems components.
09.53	Describe the operation of a regenerative braking system.
10.0	Demonstrate proficiency in diagnosing/troubleshooting electrical/electronic related components.-The student will be able to:
10.01	Use wiring diagrams during diagnosis of electrical circuit problems.
10.02	Check electrical circuits with a test light; determine necessary action.
10.03	Check voltage and voltage drop in electrical/electronic circuits using a digital multi-meter (DMM); determine needed repairs.
10.04	Check current flow in electrical/electronic circuits and components using an ammeter; determine necessary action.
10.05	Check electrical circuits using jumper wires; determine necessary action.
10.06	Find shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
10.07	Measure and diagnose the cause(s) of abnormal key-off battery drain, parasitic draw; determine necessary action.
10.08	Inspect and test fusible links, circuit breakers, and fuses; replace as needed.
10.09	Inspect and test switches, connectors, relays, and wires of electrical/electronic circuits; repair or replace as needed.
Battery Diagnosis and Service	
10.10	Perform battery state-of-charge test; determine needed service.
10.11	Perform battery capacity and conductance (load, high-rate discharge) test; determine needed service.

10.12	Maintain or restore electronic memory functions.
10.13	Inspect, clean, and replace battery.
10.14	Perform slow/fast battery charge.
10.15	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.
10.16	Start a vehicle using jumper cables using a battery auxiliary power supply.
10.17	Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
10.18	Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
Starting System Diagnosis and Repair	
10.19	Perform starter current draw and circuit voltage drop test; determine necessary action.
10.20	Inspect and test starter relays and solenoids; replace as needed.
10.21	Remove and replace/reinstall starter.
10.22	Perform starter bench tests; determine necessary action.
10.23	Inspect, test, and repair or replace switches, connectors, and wires of starter control circuits.
10.24	Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
Charging System Diagnosis and Repair	
10.25	Diagnose charging system problems that cause an undercharge, a no-charge or an overcharge condition.
10.26	Inspect and adjust alternator drive belts; replace as needed.
10.27	Remove, inspect, and replace/reinstall alternator.
10.28	Perform charging circuit voltage drop tests; determine needed repairs.
Lighting Systems Diagnosis and Repair	
10.29	Diagnose brighter than normal, intermittent, dim or no light operation.
10.30	Inspect, replace, and aim headlights and bulbs.
10.31	Inspect and diagnose incorrect turn signal or hazard light operation; repair or replace as needed.
10.32	Identify system voltage and safety precautions associated with high-intensity discharge headlights.
Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair	
10.33	Diagnose intermediate, high, low or no gauge readings.
10.34	Inspect and test gauges and gauge sending units; replace as needed.
10.35	Inspect and test connectors, wires, and printed circuit boards of gauge circuits; repair or replace as needed.

10.36	Diagnose incorrect operation of warning devices and other driver information systems.
10.37	Diagnose intermediate, high, low or no readings on electronic instrument clusters.
10.38	Inspect and test sensors, sending units, connectors, and wires of electronic instrument circuits; repair or replace as needed.
Horn and Wiper/Washer Diagnosis and Repair	
10.39	Diagnose incorrect horn operation; repair as needed.
10.40	Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; repair as needed.
10.41	Diagnose incorrect windshield washer operation; repair as needed.
Accessories Diagnosis and Repair	
10.42	Diagnose incorrect operation of motor-driven accessory circuits; repair as needed.
10.43	Diagnose incorrect heated glass operation; repair as needed.
10.44	Diagnose incorrect electric door and hatch/trunk lock operation; repair as needed.
10.45	Diagnose incorrect operation of cruise control systems; repair as needed.
10.46	Diagnose supplemental restraint system (SRS) problems; repair as needed. (NOTE: Follow manufacturer's safety procedures to prevent accidental deployment.)
10.47	Diagnose radio static and weak, intermittent, or no radio reception.
10.48	Disable and enable an airbag system for vehicle service; verify indicator lamp operation.
10.49	Remove and reinstall door panel.
10.50	Describe the process for software transfers, software updates, or flash reprogramming on electrical modules.

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

The purpose of this program is to prepare students for employment and/or specialized training in the automotive industry. The program provides specialized corporate/association job preparatory training.

Automotive Technology Programs sponsored by automobile manufacturers require an internship at a dealership.

The program must be NATEF Master Certified and have a business plan approved by the appropriate industry affiliated organization. Instructors must be ASE Certified in all areas that they teach in addition to being certified in Engine Performance and Electrical/Electronic Systems. ASE Master Technician and Advanced Engine Performance (L1) ASE Certification is preferred. Instructors must meet the specific product certification as specified in the business plan.

Program must meet the equipment and specialty tool requirement as specified in the business plan. Must offer Federally recognized refrigerant-recycling certification training.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization 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 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: **Marine Engineering, Management & Seamanship**
Career Cluster: **Transportation, Distribution and Logistics**

AAS	
CIP Number	0647060500
Program Type	College Credit
Standard Length	66 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians 49-2093 – Electrical and Electronics Installers and Repairers, Transportation Equipment 49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-2098 – Security and Fire Alarm Systems Installers 49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists 49-3051 – Motorboat Mechanics and Service Technicians 49-9071 – Maintenance and Repair Workers, General

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 Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to installation and operation of diesel and gasoline engines; troubleshooting for diesel and gasoline engines; engine maintenance; propeller selection; corrosion control; fiberglass hull repair; vessel nomenclature; safety, installation, diagnosing and troubleshooting marine electronic devices and systems.

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 66 credit hours.

Standards

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

01.0 Perform basic shop practices.
02.0 Describe operational theory of (2) two and (4) four cycle engines - Diesel and Gasoline.
03.0 Use service manuals and parts references.
04.0 Perform basic welding skills.
05.0 Remove and install engines.
06.0 Recondition and service engines.
07.0 Perform diagnosis service and repairs to all types of marine ignition systems.
08.0 Develop skills in electrical-electronic theory of operation and application.
09.0 Troubleshoot and repair fuel systems.
10.0 Service cooling systems.
11.0 Service exhaust systems.
12.0 Identify special marine principles.
13.0 Repair inboard drive systems.
14.0 Rig boats.
15.0 Repair lower units.
16.0 Perform corrosion experiments and understand corrosion control.
17.0 Apply fiberglass construction and maintenance procedures.
18.0 Demonstrate appropriate communication skills.
19.0 Demonstrate appropriate math skills.
20.0 Demonstrate appropriate understanding of basic science.
21.0 Demonstrate and practice employability skills.
22.0 Demonstrate an understanding of entrepreneurship.
23.0 Auxiliary systems.

Florida Department of Education
Student Performance Standards

Program Title: Marine Engineering, Management & Seamanship
CIP Numbers: 0647060500
Program Length: 66 credit hours
SOC Code(s): 17-3023, 49-2093, 49-2094, 49-2096, 49-2098, 49-3031, 49-3051, 49-9071

Refer to Rule 6A-14.030 (5), F.A.C., for the minimum amount of general education coursework required in the Associate in Applied Science (AAS) degree. At the completion of this program, the student will be able to:	
01.0	Perform basic shop practices.-The student will be able to:
01.01	Perform calculations with square roots and percentage.
01.02	Change fractions to decimals and decimals to fractions.
01.03	Understand the basic concepts of force, work, power, and motion
01.04	Determine metric system measurements.
01.05	Comply with safety rules and regulations.
01.06	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.07	Understand the concept of friction and the different types of mechanical friction.
01.08	Operate hand tools safely and properly.
01.09	Set up and use power tools safely and properly.
01.10	Set up and use precision measuring tools.
01.11	Drill and remove broken studs and install helicoils.
01.12	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
01.13	Install fasteners such as screws, bolts and keys; and utilize screw extractor, thread cutting tape and dies.
01.14	Locate and match electrical units by their symbols on a wiring diagram.
01.15	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
02.0	Describe operational theory of (2) two and (4) four cycle engines diesel and gasoline.-The student will be able to:
02.01	Distinguish between the characteristics of four-stroke cycle engine including diesel engines.
02.02	Identify the principal engine systems such as: Fuel, Cooling, Lubrication, Air Intake, and Electrical.
02.03	Identify basic engine parts.
02.04	Describe the functions of the crankshaft, camshaft, pistons, connecting rods, engine block, head valves, and accessories.

02.05	List the information which may be found on the engine nameplate.
02.06	Describe types of motion and simple machines and characteristics of energy.
02.07	Calculate problems using the formula for work, horsepower and torque.
02.08	Describe the main theoretical concept of heat engines.
02.09	Describe the process by which an internal combustion engine converts chemical energy into rotary motion.
02.10	Calculate problems using the formulas for engine cubic displacement and compression ratio.
02.11	Describe the principles of operation of four-and two-stroke cycle engines.
02.12	Identify the parts of a camshaft lobe-crankshaft lobe.
02.13	Describe valve timing and overlap procedures.
02.14	Identify types of valve arrangements.
02.15	Identify types of engine construction.
02.16	Describe piston engine operation, design loop charged.
02.17	Describe the operation of two- and four-stroke cycle engines to include diesel engines.
02.18	Identify major engine manufactures in today's market.
02.19	Describe the procedure, step-by-step, to convert a boat with gasoline engines into a boat with diesel engines.
03.0	Use service manuals and parts references.-The student will be able to:
03.01	Demonstrate use of multiple and single type shop service manual.
03.02	Demonstrate use of specification handbooks and tune up charts.
03.03	Demonstrate use of manufacturer parts catalogs.
03.04	Demonstrate use of marine engine installation manuals.
03.05	Demonstrate use of manufacture's service bulletins.
03.06	Apply processes to create quotes and estimates which include, but are not limited to, parts and labor.
04.0	Perform basic welding skills.-The student will be able to:
04.01	Set up and operate gas and electric various welding equipment.
04.02	Burn (cut) material using mechanized or hand-held gas torch equipment.
04.03	Prepare metal surfaces for welding.
04.04	Identify type of metal to be welded.
04.05	Fabricate metal frames and structures.
04.06	Pressure test weldment.

04.07	Perform plug weld technique.
04.08	Gas weld ferrous metals in all positions with or without filler rod.
04.09	Perform TIG welding in aluminum and stainless steel.
04.10	Use and maintain TIG welding equipment.
04.11	Perform MIG type welding on various metals.
04.12	Use welding principles to heat and remove broken screws and bolts.
05.0	Remove and install engines.-The student will be able to:
05.01	Disconnect engine, mounts, wiring and lines.
05.02	Operate engine hoist.
05.03	Mount engine mounts, wiring and lines.
05.04	Reconnect engine mounts, wiring and lines.
05.05	Cut openings for different engine installations.
05.06	Describe the operation and mounting procedures of a jet drive propulsion unit
05.07	Align (gas and diesel) engines to manufacturers' specifications.
06.0	Recondition and service engines.-The student will be able to:
06.01	Remove and replace power head.
06.02	Disassemble engine.
06.03	Clean engine parts for inspection.
06.04	Inspect and check for proper condition.
06.05	Remove and replace oil pump.
06.06	Remove and replace fuel pump.
06.07	Replace connecting rods and bearings.
06.08	Remove and replace flywheel.
06.09	Remove and replace exhaust manifolds and risers.
06.10	Perform cylinder compression test.
06.11	Perform engine tune up.
06.12	Perform operational inspection of engine lubrication system.
06.13	Remove and service piston ring and pistons.
06.14	Fit piston pins.

	06.15	Inspect crankshaft, camshaft, connecting rods and piston assembly.
	06.16	Perform the head valves job including: inspection of the head with different methods, replacement of spring valves and seals, and grinding of head valves.
	06.17	Torque power head and lower unit to specifications.
	06.18	Hone cylinders to manufacturers' specifications.
07.0		Perform diagnosis service and repairs for all types of marine ignition systems.-The student will be able to:
	07.01	Diagnose, repair and replace malfunctions of ignition system components.
	07.02	Set ignition timing.
	07.03	Inspect secondary circuit lead wires, distributor and rotor measure resistance in secondary wires.
	07.04	Analyze or adjust engine performance using engine computer diagnostic software.
	07.05	Remove and replace spark plugs.
	07.06	Time the ignition system for O/B engines.
	07.07	Use specialized test equipment.
	07.08	Test CD type ignition systems.
	07.09	Describe differences between marine and automotive type ignition components.
	07.10	Observe safety practices in marine applications.
	07.11	Read and interpret manufacturers wire diagrams.
	07.12	Operate an engine dynamometer.
08.0		Develop skills in electrical-electronic theory of operation and application.-The student will be able to:
	08.01	Apply Ohm's Law to series circuit.
	08.02	Apply Ohm's Law to parallel circuits.
	08.03	Apply Ohm's Law to series-parallel circuits.
	08.04	Perform continuity test.
	08.05	Describe the theory and operation of alternators.
	08.06	Diagnose and repair or replace charging system regulator.
	08.07	Service or replace battery cables and battery box.
	08.08	Diagnose, repair or replace starter.
	08.09	Diagnose and repair malfunctions in the cranking system.
	08.10	Perform operational inspection of lighting system.

08.11	Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
08.12	Repair or replace switches to include ignition switches.
08.13	Repair or replace fuse block assembly.
08.14	Locate and repair shorts and open circuits in wiring.
08.15	Inspect or replace rectifier.
08.16	Replace diode assembly.
08.17	Remove, replace and repair electrical remote control assembly.
08.18	Service and install diesel and gasoline marine alarm systems.
09.0	Troubleshoot and repair fuel systems.-The student will be able to:
09.01	Identify fuel system components.
09.02	Explain operation of fuel system and components.
09.03	Repair and adjust carburetor.
09.04	Repair gasoline injection systems.
09.05	Replace fuel system components.
09.06	Identify fuel systems malfunction.
09.07	Replace fuel filter.
09.08	Repair fuel lines.
09.09	Service automatic or manual choke.
09.10	Service fuel pump.
09.11	Analyze for foreign particles in fuel system.
09.12	Correct fuel tank installation.
09.13	Test engines fuel flow using manufacturers' procedures and test equipment.
09.14	Identify fuel and oil specification for outboard motors, four-cycle engines and diesel applications.
09.15	Diagnose the operation of diesel fuel injector nozzles.
09.16	Diagnose the operation of diesel fuel pumps
09.17	Describe the operation and adjustment procedures of unit injectors.
09.18	Correct procedure and timing of fuel injector pumps.
09.19	Conduct diesel fuel pressure test.
09.20	Explain the operation of the fuel rack on multiple plunger fuel injection pumps.

10.0	Service cooling systems.-The student will be able to:
10.01	Check engine temperature.
10.02	Test thermostat.
10.03	Inspect and/or replace water pump.
10.04	Inspect and/or replace circulating water pump.
10.05	Pressure test cooling system.
10.06	Remove, clean and replace water cooling parts.
10.07	Inspect and repair heat exchanges on gasoline and marine diesel engine.
10.08	Describe the operation and maintenance of marine keel coolers.
10.09	Identify different types of approved coolant used in marine closed cooling systems.
10.10	Check engine block cooling passages for corrosion and build-up.
11.0	Service exhaust systems.-The student will be able to:
11.01	Remove, inspect and replace an exhaust housing.
11.02	Remove, inspect and replace inner exhaust housing.
11.03	Remove, inspect and replace seal.
11.04	Remove, inspect and replace aft exhaust cover.
11.05	Remove, inspect and replace rubber mount.
11.06	Remove, inspect and replace clamp.
11.07	Remove, inspect and replace mount cover.
11.08	Remove, inspect and replace water tube.
11.09	Inspect service turbo charger.
11.10	Recommend correct exhaust tubing for different marine applications.
11.11	Service marine water cooled exhaust systems.
11.12	Determine back pressure by under stator exhaust applications.
12.0	Identify special marine principles.-The student will be able to:
12.01	Explain basic principles of thrust in marine applications.
12.02	Explain basic principles of propulsion in marine applications.
12.03	Explain correct propeller selection and performance.
12.04	Identify types of hulls used in marine applications.

	12.05 Explain speed-length ratio and calculate hull speed and engine selection.
	12.06 Identify bow angle and its effect on performance.
	12.07 Perform test tank operations using manufacturer's test wheels.
	12.08 Identify transom heights and explain the effects on engine performance/speed/horsepower.
13.0	Repair inboard drive systems.-The student will be able to:
	13.01 Inspect gear housing assembly.
	13.02 Determine fluid levels.
	13.03 Adjust gear linkages.
	13.04 Torque mounting bolts.
	13.05 Inspect drive shaft.
	13.06 Lubricate universal joint.
	13.07 Inspect gimbal bearing.
	13.08 Measure drive shaft angle and runout.
	13.09 Replace power transmission system.
	13.10 Rebuild power transmission.
	13.11 Correctly apply manufacturers' procedures in shimming and adjusting operations.
14.0	Rig boats.-The student will be able to:
	14.01 Install engine steering components.
	14.02 Install and service electrical wiring harness.
	14.03 Install trim tabs on outboard and stern drives, both electrical and hydraulic type.
	14.04 Identify sea drive installation.
	14.05 List methods of outboard motor transom bracket installation.
	14.06 Describe and illustrate correct lighting/wiring procedures.
	14.07 Install engine remote control by manufacturers' specifications.
15.0	Repair lower units.-The student will be able to:
	15.01 Lubricate lower unit.
	15.02 Pressure and vacuum test lower unit.
	15.03 Lubricate transom steering busing, cables, etc.
	15.04 Inspect, clean and lubricate propeller shaft.

15.05	Inspect and install propeller.
15.06	Remove and replace magnets in lower unit.
15.07	Inspect, remove and replace vertical drive gear.
15.08	Remove, inspect and replace clutch dog.
15.09	Remove, inspect and replace clutch coils.
15.10	Remove, inspect and replace drive shaft pinion.
15.11	Remove, inspect and replace drive components.
15.12	Remove, inspect and replace lower unit seals.
15.13	Remove and replace swivel bracket.
15.14	Remove, inspect and replace forward and reverse driving gears.
15.15	Remove, inspect and replace drive shaft and components.
15.16	Remove, inspect and replace hydraulic pump, shaft rod end plunger.
15.17	Adjust trim tab.
15.18	Inspect and replace U-joints.
15.19	Inspect and repair or replace lower unit lock.
15.20	Remove, replace and repair tilt assemblies to include hydraulic tilt.
15.21	Correctly shim lower units to engine manufacturer's specifications.
15.22	Disassemble/reassemble stern drive gear cases.
15.23	Disassemble/inspect/service/reassemble inboard marine transmissions both gasoline and diesel.
15.24	Demonstrate the ability to analyze and solve mechanical problems.
15.25	Develop individual responsibility for work done in the lab.
15.26	Develop an understanding and skill in testing and diagnosing marine engine service problems and to develop appreciation of the true value of testing equipment.
15.27	Calculate torque and gear ratio.
15.28	Identify major engine manufactures’ types of gear arrangements in today’s market
15.29	Explain operation theory of mechanical shifting, electric shifting, and hydroelectric shifting.
15.30	Identify the major parts of these shifting mechanisms.
15.31	Understand by examination the principles of marine propulsion propeller theory.
15.32	Demonstrate an understanding of engine installation.

	15.33 Handle lifting devices properly.
	15.34 Diagnose planetary gear principle of operation and theory.
16.0	Perform corrosion experiments and understand corrosion control.-The student will be able to:
	16.01 Identify galvanic corrosion.
	16.02 Explain the use and function of the galvanic series.
	16.03 Understand corrosion and its prevention.
	16.04 List chemical equation and symbols.
	16.05 Demonstrate a basic knowledge of electricity.
	16.06 Identify maintenance of boat hulls and when to determine its time.
	16.07 Identify difference in corrosion and cavitation.
	16.08 Demonstrate cause of corrosion.
	16.09 List in test form, actual reports in the lab.
	16.10 Distinguish fatigue corrosion.
	16.11 Understand electrolysis and its causes of corrosions.
	16.12 Correctly prepare metals for protective coatings.
	16.13 Identify protective coatings.
	16.14 Demonstrate theory of operation of impress currents.
	16.15 Show proper installation procedure of impress current unit onboard ship.
	16.16 Maintain records and diagnose impress current failure.
	16.17 Write report analysis on corrosion in our environment.
	16.18 Identify non-metallic corrosion.
	16.19 Define special tools used in the maintenance and testing of sacrificial anodes.
	16.20 Understand acrylic and styrene copolymer coating.
	16.21 List causes of stray current corrosion.
17.0	Apply fiberglass construction and maintenance procedures.-The student will be able to:
	17.01 Describe safe handling procedures and care of fiberglass resins and materials.
	17.02 Apply mixture methods of resins, gel coat and paints.
	17.03 Describe fiberglass boat manufacturing concepts.
	17.04 Prepare a mold for casting a fiberglass hull.

	17.05 Describe installation procedures of decks and gunwale.
	17.06 Repair damaged fiberglass hulls.
	17.07 Apply modern methods of maintaining new and old fiberglass hulls.
	17.08 Demonstrate advance methods of boat building and the manufacturing of fiberglass accessories.
18.0	Demonstrate appropriate communication skills.-The student will be able to:
	18.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	18.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	18.03 Read and follow written and oral instructions.
	18.04 Answer and ask questions coherently and concisely.
	18.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	18.06 Demonstrate appropriate telephone/communication skills.
19.0	Demonstrate appropriate math skills.-The student will be able to:
	19.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	19.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	19.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	19.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	19.05 Demonstrate an understanding of federal, state and local taxes and their computation.
20.0	Demonstrate appropriate understanding of basic science.-The student will be able to:
	20.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	20.02 Draw conclusions or make inferences from data.
	20.03 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	20.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
21.0	Demonstrate employability skills.-The student will be able to:
	21.01 Conduct a job search.
	21.02 Secure information about a job.
	21.03 Identify documents which may be required when applying for a job interview.
	21.04 Complete a job application form correctly.
	21.05 Demonstrate competence in job interview techniques.

21.06	Identify and adopt acceptable work habits.
21.07	Demonstrate knowledge of how to make appropriate job changes.
21.08	Demonstrate acceptable employee health habits.
21.09	Describe the Federal Law as recorded in (29 CFR-1910.1200).
22.0	Demonstrate an understanding of entrepreneurship.-The student will be able to:
22.01	Define entrepreneurship.
22.02	Describe the importance of entrepreneurship to the American economy.
22.03	List the advantages and disadvantages of business ownership.
22.04	Identify the risks involved in ownership of a business.
22.05	Identify the necessary personal characteristics of a successful entrepreneur.
22.06	Identify the business skills needed to operate a small business efficiently and effectively.
23.0	Auxiliary systems.-The student will be able to:
23.01	Familiarize with fire protection systems.
23.02	Compare the Code of Federal Regulations (CFR) to ABYC A-4 as it applies to recreational craft and firefighting equipment.
23.03	Discuss currently used fire extinguishing agent characteristics
23.04	Practice measuring engine room compartments and tankage volumes to determine net compartment volume and correct sizing of extinguishing agent bottle systems.
23.05	Inspect engine rooms on boats and "spec out" a design for a permanently installed automatic system to include a full system layout with wiring schematic.
23.06	Install and service on-board liquefied petroleum gas and compressed natural gas systems.
23.07	Identify the differences between LPG and CNG gasses.
23.08	Inspect CO detectors and review standard installation procedures with live units.
23.09	Practice assembling a typical LPG system.
23.10	Inspect approved appliances and identify the features that make them Standards compliant.
23.11	Inspect examples of all of the systems and devices covered and identify the key points mentioned within the respective standards.
23.12	Compare the differences between global LPG installation Standards and ABYC Standards.
23.13	Install and Repair Piping and Plumbing/Potable Water Systems.
23.14	Drill and prepare cored composite hull for installation of a seacock and learn the importance of isolation of metallic thru-hull fittings on aluminum and steel vessels.
23.15	Inspect bilge pump and scupper installations on a variety of boats in the IYRS collection to determine compliance with the two ABYC standards.

23.16	Design and build a potable hot and cold water system mock up to include a pressurized system.
23.17	Inspect gray water systems on new boats and then design a system based on equipment manufacturer's recommendations, building a small mockup in the lab.
23.18	Practice the procedures necessary to properly decommission a potable water system after discussing the proper procedures for commissioning and decommissioning on board plumbing systems.
23.19	Familiarized with specific information regarding onboard tankage for fuel, water and waste.
23.20	Review ABYC Standards and USCG Federal Regulations as they apply to Gasoline and Diesel Fuel tank design and installations.
23.21	Recognize potable water storage tank requirements and ABYC Standard H-23, Potable Water Systems.
23.22	Identify issues related to waste holding tanks and cover best industry practices for their design and installation.
23.23	Learn to troubleshoot and repair tank level gauge problems.
23.24	Familiarize the student with a variety of steering system types available for power and sailing craft.
23.25	Review basic hydraulic principles as applied to steering systems, component placement and bleeding procedures as specified by the various vendors.
23.26	Review ABYC Standard P-21, Manual Hydraulic Steering Systems.
23.27	Practice selecting a system for several hypothetical boat types.
23.28	Practice steering system maintenance and adjustment procedures on steering system mock-ups.
23.29	Examine the three ABYC Standards that address steering or propulsion control systems, P-22, Steering Wheels, P-23 Steering and Propulsion Controls for Jet Boats, and P-24 Electric/Electronic Propulsion Control Systems.
23.30	Demonstrate knowledge of Federal and local regulations related to waste water systems.
23.31	Identify Federal Laws as they apply to marine sanitation systems as installed on boats and compile a written report on regional and local laws as they apply to marine sanitation devices and overboard discharge of gray water and black water.
23.32	Inspect systems to determine if the design criteria of the MSD's installation have been met and how to service anti-siphon systems and deal with the problem of a system blockage.
23.33	Provide further detail to the typical type two manually operated systems most common on recreational boats, commissioning and decommissioning, and routine servicing of the various systems.
23.34	Inspect a vacuum-flush system and their specialized installation, design and service requirements.
23.35	Use of auxiliary power systems and gensets.
23.36	Installation, maintenance & repair of direct current generators.
23.37	Installation, maintenance & repair of alternate current generators.
23.38	Installation, maintenance & repair of governors.
23.39	Bow Thrusters, stabilizers, and stabilizing systems.
23.40	Discuss various types of thrusters.
23.41	How bow & stern thrusters operate.

23.42	Maintenance and repair of thruster systems.
23.43	Discuss various types of stabilizers & systems.
23.44	Define: Heave, pitch, yaw, sway, and roll.
23.45	Maintenance & repair of stabilizers & stabilizing systems.
23.46	Principles of air conditioning and refrigeration systems on marine vessels.
23.47	Discuss destruction of ozone by chlorine and HCFC refrigerants.
23.48	Understand the refrigeration cycle.
23.49	Determine EPA requirements for refrigeration.
23.50	Working with refrigeration evacuation and recovery equipment.
23.51	Troubleshooting refrigeration & A/C equipment.
23.52	Demonstrate single and double flaring of copper piping.
23.53	Understanding Hydraulic Systems.
23.54	Describe the principle of Hydraulic systems.
23.55	Understanding hydraulic cylinders, actuators, and pressures.
23.56	Troubleshooting hydraulic systems.
23.57	Maintenance & repair of hydraulic systems.
23.58	Describe types of windlass systems.
23.59	Describe components of a windlass system and how they are used: bitter end, bits gypsies/wildcats, and devil's claw.
23.60	Installation, maintenance & repair of windlass systems.
23.61	Describe different methods of desalinization.
23.62	Define the components of a desalinization systems.
23.63	Maintenance & repair of desalinization systems.

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)

SkillsUSA 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.

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 AAS degree program includes the following College Credit Certificates:

Marine Electrician (0647060506) – 12 credit hours
Marine Propulsion Technician (0647060505) – 24 credit hours
Marine Systems Technician (0647060513) − 24 credit hours
Marine Technology (0647060512) – 34 credit hours
Professional Welder (0647060516) – 16 credit hours

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

Florida Department of Education
Curriculum Framework

Program Title: **Marine Propulsion Technician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060505
Program Type	College Credit Certificate (CCC)
Standard Length	24 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians 49-2093 – Electrical and Electronics Installers and Repairers, Transportation Equipment 49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-2098 – Security and Fire Alarm Systems Installers 49-3031 – Bus and Truck Mechanics and Diesel Engine Specialists 49-3051 – Motorboat Mechanics and Service Technicians 49-9071 – Maintenance and Repair Workers, General

Purpose

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program 0647060500.

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to vessel nomenclature, safety, installation, diagnosing and troubleshooting marine electronic devices and systems, the installation and operation of diesel and gasoline engines; troubleshooting for diesel and gasoline engines; and engine maintenance.

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

Standards

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

01.0 Perform basic shop practices.
02.0 Describe operational theory of (2) two and (4) four cycle engines - Diesel and Gasoline.
03.0 Use service manuals and parts references.
04.0 Remove and install engines.
05.0 Recondition and service engines.
06.0 Perform diagnosis service and repairs to all types of marine ignition systems.
07.0 Develop skills in electrical-electronic theory of operation and application.
08.0 Troubleshoot and repair fuel systems.
09.0 Service cooling systems.
10.0 Service exhaust systems.
11.0 Identify special marine principles.
12.0 Repair inboard drive systems.
13.0 Repair lower units.
14.0 Demonstrate appropriate communication skills.
15.0 Demonstrate appropriate math skills.
16.0 Demonstrate appropriate understanding of basic science.
17.0 Demonstrate and practice employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Propulsion Technician**
CIP Number: **0647060505**
Program Length: **24 Credit Hours**
SOC Code(s): **17-3023, 49-2093, 49-2094, 49-2096, 49-2098, 49-3031, 49-3051, 49-9071**

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program 0647060500. At the completion of this program, the student will be able to:	
01.0	Perform basic shop practices.-The student will be able to:
01.01	Perform calculations with square roots and percentage.
01.02	Change fractions to decimals and decimals to fractions.
01.03	Determine metric system measurements.
01.04	Comply with safety rules and regulations.
01.05	Operate hand tools safely and properly.
01.06	Set up and use power tools safely and properly.
01.07	Set up and use precision measuring tools.
01.08	Drill and remove broken studs and install helicoils.
01.09	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
01.10	Install fasteners such as screws, bolts and keys; and utilize screw extractor, thread cutting tape and dies.
01.11	Locate and match electrical units by their symbols on a wiring diagram.
01.12	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
02.0	Describe operational theory of (2) two and (4) four cycle engines diesel and gasoline.-The student will be able to:
02.01	Distinguish between the characteristics of four-stroke cycle engine including diesel engines.
02.02	Identify the principal engine systems such as: Fuel, Cooling, Lubrication, Air Intake, and Electrical.
02.03	Identify basic engine parts.
02.04	Describe the functions of the crankshaft, camshaft, pistons, connecting rods, engine block, head valves, and accessories.
02.05	List the information which may be found on the engine nameplate.
02.06	Describe types of motion and simple machines and characteristics of energy.
02.07	Calculate problems using the formula for work, horsepower and torque.

	02.08 Describe the main theoretical concept of heat engines.
	02.09 Describe the process by which an internal combustion engine converts chemical energy into rotary motion.
	02.10 Calculate problems using the formulas for engine cubic displacement and compression ratio.
	02.11 Describe the principles of operation of four-and two-stroke cycle engines.
	02.12 Identify the parts of a camshaft lobe-crankshaft lobe.
	02.13 Describe valve timing and overlap procedures.
	02.14 Identify types of valve arrangements.
	02.15 Identify types of engine construction.
	02.16 Describe piston engine operation, design loop charged.
	02.17 Describe the operation of two- and four-stroke cycle engines to include diesel engines.
	02.18 Identify major engine manufactures in today's market.
	02.19 Describe the procedure, step-by-step, to convert a boat with gasoline engines into a boat with diesel engines.
03.0	Use service manuals and parts references.-The student will be able to:
	03.01 Demonstrate use of multiple and single type shop service manual.
	03.02 Demonstrate use of specification handbooks and tune up charts.
	03.03 Demonstrate use of manufacturer parts catalogs.
	03.04 Demonstrate use of marine engine installation manuals.
	03.05 Demonstrate use of manufacture's service bulletins.
	03.06 Apply processes to create quotes and estimates which include, but are not limited to, parts and labor.
04.0	Remove and install engines.-The student will be able to:
	04.01 Disconnect engine, mounts, wiring and lines.
	04.02 Operate engine hoist.
	04.03 Mount engine mounts, wiring and lines.
	04.04 Reconnect engine mounts, wiring and lines.
	04.05 Cut openings for different engine installations.
	04.06 Describe the operation and mounting procedures of a jet drive propulsion unit
	04.07 Align (gas and diesel) engines to manufacturers' specifications.
05.0	Recondition and service engines.-The student will be able to:
	05.01 Remove and replace power head.

	05.02	Disassemble engine.
	05.03	Clean engine parts for inspection.
	05.04	Inspect and check for proper condition.
	05.05	Remove and replace oil pump.
	05.06	Remove and replace fuel pump.
	05.07	Replace connecting rods and bearings.
	05.08	Remove and replace flywheel.
	05.09	Remove and replace exhaust manifolds and risers.
	05.10	Perform cylinder compression test.
	05.11	Perform engine tune up.
	05.12	Perform operational inspection of engine lubrication system.
	05.13	Remove and service piston ring and pistons.
	05.14	Fit piston pins.
	05.15	Inspect crankshaft, camshaft, connecting rods and piston assembly.
	05.16	Perform the head valves job including: inspection of the head with different methods, replacement of spring valves and seals, and grinding of head valves.
	05.17	Torque power head and lower unit to specifications.
	05.18	Hone cylinders to manufacturers' specifications.
06.0	Perform diagnosis service and repairs for all types of marine ignition systems.-The student will be able to:	
	06.01	Diagnose, repair and replace malfunctions of ignition system components.
	06.02	Set ignition timing.
	06.03	Inspect secondary circuit lead wires, distributor and rotor measure resistance in secondary wires.
	06.04	Analyze or adjust engine performance using engine computer diagnostic software.
	06.05	Remove and replace spark plugs.
	06.06	Time the ignition system for O/B engines.
	06.07	Use specialized test equipment.
	06.08	Test CD type ignition systems.
	06.09	Describe differences between marine and automotive type ignition components.
	06.10	Observe safety practices in marine applications.

	06.11 Read and interpret manufacturers wire diagrams.
	06.12 Operate an engine dynamometer.
07.0	Develop skills in electrical-electronic theory of operation and application.-The student will be able to:
	07.01 Apply Ohm's Law to series circuit.
	07.02 Apply Ohm's Law to parallel circuits.
	07.03 Apply Ohm's Law to series-parallel circuits.
	07.04 Perform continuity test.
	07.05 Describe the theory and operation of alternators.
	07.06 Diagnose and repair or replace charging system regulator.
	07.07 Service or replace battery cables and battery box.
	07.08 Diagnose, repair or replace starter.
	07.09 Diagnose and repair malfunctions in the cranking system.
	07.10 Perform operational inspection of lighting system.
	07.11 Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
	07.12 Repair or replace switches to include ignition switches.
	07.13 Repair or replace fuse block assembly.
	07.14 Locate and repair shorts and open circuits in wiring.
	07.15 Inspect or replace rectifier.
	07.16 Replace diode assembly.
	07.17 Remove, replace and repair electrical remote control assembly.
	07.18 Service and install diesel and gasoline marine alarm systems.
08.0	Troubleshoot and repair fuel systems.-The student will be able to:
	08.01 Identify fuel system components.
	08.02 Explain operation of fuel system and components.
	08.03 Repair and adjust carburetor.
	08.04 Repair gasoline injection systems.
	08.05 Replace fuel system components.
	08.06 Identify fuel systems malfunction.
	08.07 Replace fuel filter.

	08.08 Repair fuel lines.
	08.09 Service automatic or manual choke.
	08.10 Service fuel pump.
	08.11 Analyze for foreign particles in fuel system.
	08.12 Correct fuel tank installation.
	08.13 Test engines fuel flow using manufacturers' procedures and test equipment.
	08.14 Identify fuel and oil specification for outboard motors, four-cycle engines and diesel applications.
	08.15 Diagnose the operation of diesel fuel injector nozzles.
	08.16 Diagnose the operation of diesel fuel pumps
	08.17 Describe the operation and adjustment procedures of unit injectors.
	08.18 Correct procedure and timing of fuel injector pumps.
	08.19 Conduct diesel fuel pressure test.
	08.20 Explain the operation of the fuel rack on multiple plunger fuel injection pumps.
09.0	Service cooling systems.-The student will be able to:
	09.01 Check engine temperature.
	09.02 Test thermostat.
	09.03 Inspect and/or replace water pump.
	09.04 Inspect and/or replace circulating water pump.
	09.05 Pressure test cooling system.
	09.06 Remove, clean and replace water cooling parts.
	09.07 Inspect and repair heat exchanges on gasoline and marine diesel engine.
	09.08 Describe the operation and maintenance of marine keel coolers.
	09.09 Identify different types of approved coolant used in marine closed cooling systems.
	09.10 Check engine block cooling passages for corrosion and build-up.
10.0	Service exhaust systems.-The student will be able to:
	10.01 Remove, inspect and replace an exhaust housing.
	10.02 Remove, inspect and replace inner exhaust housing.
	10.03 Remove, inspect and replace seal.
	10.04 Remove, inspect and replace aft exhaust cover.

10.05	Remove, inspect and replace rubber mount.
10.06	Remove, inspect and replace clamp.
10.07	Remove, inspect and replace mount cover.
10.08	Remove, inspect and replace water tube.
10.09	Inspect service turbo charger.
10.10	Recommend correct exhaust tubing for different marine applications.
10.11	Service marine water cooled exhaust systems.
10.12	Determine back pressure by under stator exhaust applications.
11.0	Identify special marine principles.-The student will be able to:
11.01	Explain basic principles of thrust in marine applications.
11.02	Explain basic principles of propulsion in marine applications.
11.03	Explain correct propeller selection and performance.
11.04	Identify types of hulls used in marine applications.
11.05	Explain speed-length ratio and calculate hull speed and engine selection.
11.06	Identify bow angle and its effect on performance.
11.07	Perform test tank operations using manufacturer's test wheels.
11.08	Identify transom heights and explain the effects on engine performance/speed/horsepower.
12.0	Repair inboard drive systems.-The student will be able to:
12.01	Inspect gear housing assembly.
12.02	Determine fluid levels.
12.03	Adjust gear linkages.
12.04	Torque mounting bolts.
12.05	Inspect drive shaft.
12.06	Lubricate universal joint.
12.07	Inspect gimbal bearing.
12.08	Measure drive shaft angle and runout.
12.09	Replace power transmission system.
12.10	Rebuild power transmission.
12.11	Correctly apply manufacturers' procedures in shimming and adjusting operations.

13.0	Repair lower units.-The student will be able to:
13.01	Lubricate lower unit.
13.02	Pressure and vacuum test lower unit.
13.03	Lubricate transom steering busing, cables, etc.
13.04	Inspect, clean and lubricate propeller shaft.
13.05	Inspect and install propeller.
13.06	Remove and replace magnets in lower unit.
13.07	Inspect, remove and replace vertical drive gear.
13.08	Remove, inspect and replace clutch dog.
13.09	Remove, inspect and replace clutch coils.
13.10	Remove, inspect and replace drive shaft pinion.
13.11	Remove, inspect and replace drive components.
13.12	Remove, inspect and replace lower unit seals.
13.13	Remove and replace swivel bracket.
13.14	Remove, inspect and replace forward and reverse driving gears.
13.15	Remove, inspect and replace drive shaft and components.
13.16	Remove, inspect and replace hydraulic pump, shaft rod end plunger.
13.17	Adjust trim tab.
13.18	Inspect and replace U-joints.
13.19	Inspect and repair or replace lower unit lock.
13.20	Remove, replace and repair tilt assemblies to include hydraulic tilt.
13.21	Correctly shim lower units to engine manufacturer's specifications.
13.22	Disassemble/reassemble stern drive gear cases.
13.23	Disassemble/inspect/service/reassemble inboard marine transmissions both gasoline and diesel.
13.24	Demonstrate the ability to analyze and solve mechanical problems.
13.25	Develop individual responsibility for work done in the lab.
13.26	Develop an understanding and skill in testing and diagnosing marine engine service problems and to develop appreciation of the true value of testing equipment.
13.27	Calculate torque and gear ratio.

13.28	Identify major engine manufactures' types of gear arrangements in today's market
13.29	Explain operation theory of mechanical shifting, electric shifting, and hydroelectric shifting.
13.30	Identify the major parts of these shifting mechanisms.
13.31	Understand by examination the principles of marine propulsion propeller theory.
13.32	Demonstrate an understanding of engine installation.
13.33	Handle lifting devices properly.
13.34	Diagnose planetary gear principle of operation and theory.
14.0	Demonstrate appropriate communication skills.-The student will be able to:
14.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
14.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
14.03	Read and follow written and oral instructions.
14.04	Answer and ask questions coherently and concisely.
14.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
14.06	Demonstrate appropriate telephone/communication skills.
15.0	Demonstrate appropriate math skills.-The student will be able to:
15.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
15.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
15.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
15.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
15.05	Demonstrate an understanding of federal, state and local taxes and their computation.
16.0	Demonstrate appropriate understanding of basic science.-The student will be able to:
16.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
16.02	Draw conclusions or make inferences from data.
16.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
16.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
17.0	Demonstrate employability skills.-The student will be able to:
17.01	Conduct a job search.
17.02	Secure information about a job.

17.03	Identify documents which may be required when applying for a job interview.
17.04	Complete a job application form correctly.
17.05	Demonstrate competence in job interview techniques.
17.06	Identify and adopt acceptable work habits.
17.07	Demonstrate knowledge of how to make appropriate job changes.
17.08	Demonstrate acceptable employee health habits.
17.09	Describe the Federal Law as recorded in (29 CFR-1910.1200).

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)

SkillsUSA is the intercurricular career and technical student organization 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 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: **Marine Electrician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060506
Program Type	College Credit Certificate (CCC)
Standard Length	12 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians 49-2093 – Electrical and Electronics Installers and Repairers, Transportation Equipment 49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-2098 – Security and Fire Alarm Systems Installers 49-9071 – Maintenance and Repair Workers, General

Purpose

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program 0647060500.

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to vessel nomenclature, safety, installation, diagnosing and troubleshooting marine electronic devices and systems.

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

Standards

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

01.0 Perform basic shop practices.
02.0 Use service manuals and parts references.
03.0 Develop skills in electrical-electronic theory of operation and application.
04.0 Demonstrate appropriate communication skills.
05.0 Demonstrate appropriate math skills.
06.0 Demonstrate appropriate understanding of basic science.
07.0 Demonstrate and practice employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Electrician**
CIP Number: **0647060506**
Program Length: **12 Credit Hours**
SOC Code(s): **17-3023, 49-2093, 49-2094, 49-2096, 49-2098, 49-9071**

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program 0647060500. At the completion of this program, the student will be able to:	
01.0	Perform basic shop practices.-The student will be able to:
	01.01 Perform calculations with square roots and percentage.
	01.02 Change fractions to decimals and decimals to fractions.
	01.03 Determine metric system measurements.
	01.04 Comply with safety rules and regulations.
	01.05 Operate hand tools safely and properly.
	01.06 Set up and use power tools safely and properly.
	01.07 Set up and use precision measuring tools.
	01.08 Drill and remove broken studs and install helicoils.
	01.09 Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
	01.10 Install fasteners such as screws, bolts and keys; and utilize screw extractor, thread cutting tape and dies.
	01.11 Locate and match electrical units by their symbols on a wiring diagram.
	01.12 Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
02.0	Use service manuals and parts references.-The student will be able to:
	02.01 Demonstrate use of multiple and single type shop service manual.
	02.02 Demonstrate use of specification handbooks and tune up charts.
	02.03 Demonstrate use of manufacturer parts catalogs.
	02.04 Demonstrate use of marine engine installation manuals.
	02.05 Demonstrate use of manufacture’s service bulletins.
	02.06 Apply processes to create quotes and estimates which include, but are not limited to, parts and labor.
03.0	Develop skills in electrical-electronic theory of operation and application.-The student will be able to:

03.01	Apply Ohm's Law to series circuit.
03.02	Apply Ohm's Law to parallel circuits.
03.03	Apply Ohm's Law to series-parallel circuits.
03.04	Perform continuity test.
03.05	Describe the theory and operation of alternators.
03.06	Diagnose and repair or replace charging system regulator.
03.07	Service or replace battery cables and battery box.
03.08	Diagnose, repair or replace starter.
03.09	Diagnose and repair malfunctions in the cranking system.
03.10	Perform operational inspection of lighting system.
03.11	Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
03.12	Repair or replace switches to include ignition switches.
03.13	Repair or replace fuse block assembly.
03.14	Locate and repair shorts and open circuits in wiring.
03.15	Inspect or replace rectifier.
03.16	Replace diode assembly.
03.17	Remove, replace and repair electrical remote control assembly.
03.18	Service and install diesel and gasoline marine alarm systems.
04.0	Demonstrate appropriate communication skills.-The student will be able to:
04.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
04.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
04.03	Read and follow written and oral instructions.
04.04	Answer and ask questions coherently and concisely.
04.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
04.06	Demonstrate appropriate telephone/communication skills.
05.0	Demonstrate appropriate math skills.-The student will be able to:
05.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
05.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.

	05.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	05.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	05.05	Demonstrate an understanding of federal, state and local taxes and their computation.
06.0	Demonstrate appropriate understanding of basic science.-The student will be able to:	
	06.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	06.02	Draw conclusions or make inferences from data.
	06.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	06.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
07.0	Demonstrate employability skills.-The student will be able to:	
	07.01	Conduct a job search.
	07.02	Secure information about a job.
	07.03	Identify documents which may be required when applying for a job interview.
	07.04	Complete a job application form correctly.
	07.05	Demonstrate competence in job interview techniques.
	07.06	Identify and adopt acceptable work habits.
	07.07	Demonstrate knowledge of how to make appropriate job changes.
	07.08	Demonstrate acceptable employee health habits.
	07.09	Describe the Federal Law as recorded in (29 CFR-1910.1200).

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)

SkillsUSA 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: **Marine Technology**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060512
Program Type	College Credit Certificate (CCC)
Standard Length	34 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3051 – Motorboat Mechanics and Service Technicians

Purpose

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program (0647060500).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to installation and operation of diesel and gasoline engines; troubleshooting for diesel and gasoline engines; engine maintenance; propeller selection; and corrosion control.

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

Standards

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

01.0 Perform basic shop practices.
02.0 Describe operational theory of (2) two and (4) four cycle engines - Diesel and Gasoline.
03.0 Use service manuals and parts references.
04.0 Perform basic welding skills.
05.0 Remove and install engines.
06.0 Recondition and service engines.
07.0 Perform diagnosis service and repairs to all types of marine ignition systems.
08.0 Develop skills in electrical-electronic theory of operation and application.
09.0 Troubleshoot and repair fuel systems.
10.0 Service cooling systems.
11.0 Service exhaust systems.
12.0 Repair inboard drive systems.
13.0 Rig boats.
14.0 Repair lower units.
15.0 Perform corrosion experiments and understand corrosion control.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Technology**
CIP Number: **0647060512**
Program Length: **34 credit hours**
SOC Code(s): **49-3051**

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program (0647060500). At the completion of this program, the student will be able to:	
01.0	Perform basic shop practices.-The student will be able to:
01.01	Perform calculations with square roots and percentage.
01.02	Change fractions to decimals and decimals to fractions.
01.03	Determine metric system measurements.
01.04	Comply with safety rules and regulations.
01.05	Operate hand tools safely and properly.
01.06	Set up and use power tools safely and properly.
01.07	Set up and use precision measuring tools.
01.08	Drill and remove broken studs and install helicoils.
01.09	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
01.10	Install fasteners such as screws, bolts and keys; and utilize screw extractor, thread cutting tape and dies.
01.11	Locate and match electrical units by their symbols on a wiring diagram.
01.12	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
02.0	Describe operational theory of (2) two and (4) four cycle engines diesel and gasoline.-The student will be able to:
02.01	Distinguish between the characteristics of four-stroke cycle engine including diesel engines.
02.02	Identify the principal engine systems such as: Fuel, Cooling, Lubrication, Air Intake, and Electrical.
02.03	Identify basic engine parts.
02.04	Describe the functions of the crankshaft, camshaft, pistons, connecting rods, engine block, head valves, and accessories.
02.05	List the information which may be found on the engine nameplate.
02.06	Describe types of motion and simple machines and characteristics of energy.
02.07	Calculate problems using the formula for work, horsepower and torque.

02.08	Describe the main theoretical concept of heat engines.
02.09	Describe the process by which an internal combustion engine converts chemical energy into rotary motion.
02.10	Calculate problems using the formulas for engine cubic displacement and compression ratio.
02.11	Describe the principles of operation of four-and two-stroke cycle engines.
02.12	Identify the parts of a camshaft lobe-crankshaft lobe.
02.13	Describe valve timing and overlap procedures.
02.14	Identify types of valve arrangements.
02.15	Identify types of engine construction.
02.16	Describe piston engine operation, design loop charged.
02.17	Describe the operation of two- and four-stroke cycle engines to include diesel engines.
02.18	Identify major engine manufactures in today's market.
02.19	Describe the procedure, step-by-step, to convert a boat with gasoline engines into a boat with diesel engines.
03.0	Use service manuals and parts references.-The student will be able to:
03.01	Demonstrate use of multiple and single type shop service manual.
03.02	Demonstrate use of specification handbooks and tune up charts.
03.03	Demonstrate use of manufacturer parts catalogs.
03.04	Demonstrate use of marine engine installation manuals.
03.05	Demonstrate use of manufacture's service bulletins.
03.06	Apply processes to create quotes and estimates which include, but are not limited to, parts and labor.
04.0	Perform basic welding skills.-The student will be able to:
04.01	Set up and operate gas and electric various welding equipment.
04.02	Burn (cut) material using mechanized or hand-held gas torch equipment.
04.03	Prepare metal surfaces for welding.
04.04	Identify type of metal to be welded.
04.05	Fabricate metal frames and structures.
04.06	Pressure test weldment.
04.07	Perform plug weld technique.
04.08	Gas weld ferrous metals in all positions with or without filler rod.
04.09	Perform TIG welding in aluminum and stainless steel.

04.10	Use and maintain TIG welding equipment.
04.11	Perform MIG type welding on various metals.
04.12	Use welding principles to heat and remove broken screws and bolts.
05.0	Remove and install engines.-The student will be able to:
05.01	Disconnect engine, mounts, wiring and lines.
05.02	Operate engine hoist.
05.03	Mount engine mounts, wiring and lines.
05.04	Reconnect engine mounts, wiring and lines.
05.05	Cut openings for different engine installations.
05.06	Describe the operation and mounting procedures of a jet drive propulsion unit
05.07	Align (gas and diesel) engines to manufacturers' specifications.
06.0	Recondition and service engines.-The student will be able to:
06.01	Remove and replace power head.
06.02	Disassemble engine.
06.03	Clean engine parts for inspection.
06.04	Inspect and check for proper condition.
06.05	Remove and replace oil pump.
06.06	Remove and replace fuel pump.
06.07	Replace connecting rods and bearings.
06.08	Remove and replace flywheel.
06.09	Remove and replace exhaust manifolds and risers.
06.10	Perform cylinder compression test.
06.11	Perform engine tune up.
06.12	Perform operational inspection of engine lubrication system.
06.13	Remove and service piston ring and pistons.
06.14	Fit piston pins.
06.15	Inspect crankshaft, camshaft, connecting rods and piston assembly.
06.16	Perform the head valves job including: inspection of the head with different methods, replacement of spring valves and seals, and grinding of head valves.

	06.17 Torque power head and lower unit to specifications.
	06.18 Hone cylinders to manufacturers' specifications.
07.0	Perform diagnosis service and repairs for all types of marine ignition systems.-The student will be able to:
	07.01 Diagnose, repair and replace malfunctions of ignition system components.
	07.02 Set ignition timing.
	07.03 Inspect secondary circuit lead wires, distributor and rotor measure resistance in secondary wires.
	07.04 Analyze or adjust engine performance using engine computer diagnostic software.
	07.05 Remove and replace spark plugs.
	07.06 Time the ignition system for O/B engines.
	07.07 Use specialized test equipment.
	07.08 Test CD type ignition systems.
	07.09 Describe differences between marine and automotive type ignition components.
	07.10 Observe safety practices in marine applications.
	07.11 Read and interpret manufacturers wire diagrams.
	07.12 Operate an engine dynamometer.
08.0	Develop skills in electrical-electronic theory of operation and application.-The student will be able to:
	08.01 Apply Ohm's Law to series circuit.
	08.02 Apply Ohm's Law to parallel circuits.
	08.03 Apply Ohm's Law to series-parallel circuits.
	08.04 Perform continuity test.
	08.05 Describe the theory and operation of alternators.
	08.06 Diagnose and repair or replace charging system regulator.
	08.07 Service or replace battery cables and battery box.
	08.08 Diagnose, repair or replace starter.
	08.09 Diagnose and repair malfunctions in the cranking system.
	08.10 Perform operational inspection of lighting system.
	08.11 Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
	08.12 Repair or replace switches to include ignition switches.
	08.13 Repair or replace fuse block assembly.

08.14	Locate and repair shorts and open circuits in wiring.
08.15	Inspect or replace rectifier.
08.16	Replace diode assembly.
08.17	Remove, replace and repair electrical remote control assembly.
08.18	Service and install diesel and gasoline marine alarm systems.
09.0	Troubleshoot and repair fuel systems.-The student will be able to:
09.01	Identify fuel system components.
09.02	Explain operation of fuel system and components.
09.03	Repair and adjust carburetor.
09.04	Repair gasoline injection systems.
09.05	Replace fuel system components.
09.06	Identify fuel systems malfunction.
09.07	Replace fuel filter.
09.08	Repair fuel lines.
09.09	Service automatic or manual choke.
09.10	Service fuel pump.
09.11	Analyze for foreign particles in fuel system.
09.12	Correct fuel tank installation.
09.13	Test engines fuel flow using manufacturers' procedures and test equipment.
09.14	Identify fuel and oil specification for outboard motors, four-cycle engines and diesel applications.
09.15	Diagnose the operation of diesel fuel injector nozzles.
09.16	Diagnose the operation of diesel fuel pumps
09.17	Describe the operation and adjustment procedures of unit injectors.
09.18	Correct procedure and timing of fuel injector pumps.
09.19	Conduct diesel fuel pressure test.
09.20	Explain the operation of the fuel rack on multiple plunger fuel injection pumps.
10.0	Service cooling systems.-The student will be able to:
10.01	Check engine temperature.
10.02	Test thermostat.

	10.03 Inspect and/or replace water pump.
	10.04 Inspect and/or replace circulating water pump.
	10.05 Pressure test cooling system.
	10.06 Remove, clean and replace water cooling parts.
	10.07 Inspect and repair heat exchanges on gasoline and marine diesel engine.
	10.08 Describe the operation and maintenance of marine keel coolers.
	10.09 Identify different types of approved coolant used in marine closed cooling systems.
	10.10 Check engine block cooling passages for corrosion and build-up.
11.0	Service exhaust systems.-The student will be able to:
	11.01 Remove, inspect and replace an exhaust housing.
	11.02 Remove, inspect and replace inner exhaust housing.
	11.03 Remove, inspect and replace seal.
	11.04 Remove, inspect and replace aft exhaust cover.
	11.05 Remove, inspect and replace rubber mount.
	11.06 Remove, inspect and replace clamp.
	11.07 Remove, inspect and replace mount cover.
	11.08 Remove, inspect and replace water tube.
	11.09 Inspect service turbo charger.
	11.10 Recommend correct exhaust tubing for different marine applications.
	11.11 Service marine water cooled exhaust systems.
	11.12 Determine back pressure by under stator exhaust applications.
12.0	Repair inboard drive systems.-The student will be able to:
	12.01 Inspect gear housing assembly.
	12.02 Determine fluid levels.
	12.03 Adjust gear linkages.
	12.04 Torque mounting bolts.
	12.05 Inspect drive shaft.
	12.06 Lubricate universal joint.
	12.07 Inspect gimbal bearing.

	12.08 Measure drive shaft angle and runout.
	12.09 Replace power transmission system.
	12.10 Rebuild power transmission.
	12.11 Correctly apply manufacturers' procedures in shimming and adjusting operations.
13.0	Rig boats.-The student will be able to:
	13.01 Install engine steering components.
	13.02 Install and service electrical wiring harness.
	13.03 Install trim tabs on outboard and stern drives, both electrical and hydraulic type.
	13.04 Identify sea drive installation.
	13.05 List methods of outboard motor transom bracket installation.
	13.06 Describe and illustrate correct lighting/wiring procedures.
	13.07 Install engine remote control by manufacturers' specifications.
14.0	Repair lower units.-The student will be able to:
	14.01 Lubricate lower unit.
	14.02 Pressure and vacuum test lower unit.
	14.03 Lubricate transom steering busing, cables, etc.
	14.04 Inspect, clean and lubricate propeller shaft.
	14.05 Inspect and install propeller.
	14.06 Remove and replace magnets in lower unit.
	14.07 Inspect, remove and replace vertical drive gear.
	14.08 Remove, inspect and replace clutch dog.
	14.09 Remove, inspect and replace clutch coils.
	14.10 Remove, inspect and replace drive shaft pinion.
	14.11 Remove, inspect and replace drive components.
	14.12 Remove, inspect and replace lower unit seals.
	14.13 Remove and replace swivel bracket.
	14.14 Remove, inspect and replace forward and reverse driving gears.
	14.15 Remove, inspect and replace drive shaft and components.
	14.16 Remove, inspect and replace hydraulic pump, shaft rod end plunger.

14.17	Adjust trim tab.
14.18	Inspect and replace U-joints.
14.19	Inspect and repair or replace lower unit lock.
14.20	Remove, replace and repair tilt assemblies to include hydraulic tilt.
14.21	Correctly shim lower units to engine manufacturer's specifications.
14.22	Disassemble/reassemble stern drive gear cases.
14.23	Disassemble/inspect/service/reassemble inboard marine transmissions both gasoline and diesel.
14.24	Demonstrate the ability to analyze and solve mechanical problems.
14.25	Develop individual responsibility for work done in the lab.
14.26	Develop an understanding and skill in testing and diagnosing marine engine service problems and to develop appreciation of the true value of testing equipment.
14.27	Calculate torque and gear ratio.
14.28	Identify major engine manufactures' types of gear arrangements in today's market
14.29	Explain operation theory of mechanical shifting, electric shifting, and hydroelectric shifting.
14.30	Identify the major parts of these shifting mechanisms.
14.31	Understand by examination the principles of marine propulsion propeller theory.
14.32	Demonstrate an understanding of engine installation.
14.33	Handle lifting devices properly.
14.34	Diagnose planetary gear principle of operation and theory.
15.0	Perform corrosion experiments and understand corrosion control.-The student will be able to:
15.01	Identify galvanic corrosion.
15.02	Explain the use and function of the galvanic series.
15.03	Understand corrosion and its prevention.
15.04	List chemical equation and symbols.
15.05	Demonstrate a basic knowledge of electricity.
15.06	Identify maintenance of boat hulls and when to determine its time.
15.07	Identify difference in corrosion and cavitation.
15.08	Demonstrate cause of corrosion.
15.09	List in test form, actual reports in the lab.

15.10	Distinguish fatigue corrosion.
15.11	Understand electrolysis and its causes of corrosions.
15.12	Correctly prepare metals for protective coatings.
15.13	Identify protective coatings.
15.14	Demonstrate theory of operation of impress currents.
15.15	Show proper installation procedure of impress current unit onboard ship.
15.16	Maintain records and diagnose impress current failure.
15.17	Write report analysis on corrosion in our environment.
15.18	Identify non-metallic corrosion.
15.19	Define special tools used in the maintenance and testing of sacrificial anodes.
15.20	Understand acrylic and styrene copolymer coating.
15.21	List causes of stray current corrosion.

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)

SkillsUSA is the intercurricular career and technical student organization 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 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: **Marine Systems Technician**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060513
Program Type	College Credit
Standard Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	49-2093 – Electrical and Electronics Installers and Repairers, Transportation Equipment 49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 49-2096 – Electronic Equipment Installers and Repairers, Motor Vehicles 49-2098 – Security and Fire Alarm Systems Installers 49-9071 – Maintenance and Repair Workers, General

Purpose

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program (0647060500).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to installation and operation; propeller selection; corrosion control; fiberglass hull repair; vessel nomenclature; safety, installation, diagnosing and troubleshooting marine electronic devices and systems including MSD, A/C & Refrigeration, desalinization systems, windless, hydraulics, fire suppression, and CNG & LPG systems.

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

Standards

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

01.0 Perform basic shop practices.
02.0 Use service manuals and parts references.
03.0 Develop skills in electrical-electronic theory of operation and application.
04.0 Identify special marine principles.
05.0 Perform corrosion experiments and understand corrosion control.
06.0 Apply fiberglass construction and maintenance procedures.
07.0 Demonstrate appropriate communication skills.
08.0 Demonstrate appropriate math skills.
09.0 Demonstrate appropriate understanding of basic science.
10.0 Demonstrate and practice employability skills.
11.0 Develop skills in Auxiliary Systems.

Florida Department of Education
Student Performance Standards

Program Title: **Marine Systems Technician**
CIP Numbers: **0647060513**
Program Length: **24 credit hours**
SOC Code(s): **49-2093, 49-2094, 49-2096, 49-2098, 49-9071**

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program (0647060500). At the completion of this program, the student will be able to:	
01.0	Perform basic shop practices.-The student will be able to:
01.01	Perform calculations with square roots and percentage.
01.02	Change fractions to decimals and decimals to fractions.
01.03	Understand the basic concepts of force, work, power, and motion
01.04	Determine metric system measurements.
01.05	Comply with safety rules and regulations.
01.06	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.07	Understand the concept of friction and the different types of mechanical friction.
01.08	Operate hand tools safely and properly.
01.09	Set up and use power tools safely and properly.
01.10	Set up and use precision measuring tools.
01.11	Drill and remove broken studs and install helicoils.
01.12	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
01.13	Install fasteners such as screws, bolts and keys; and utilize screw extractor, thread cutting tape and dies.
01.14	Locate and match electrical units by their symbols on a wiring diagram.
01.15	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
02.0	Use service manuals and parts references.-The student will be able to:
02.01	Demonstrate use of multiple and single type shop service manual.
02.02	Demonstrate use of specification handbooks and tune up charts.
02.03	Demonstrate use of manufacturer parts catalogs.
02.04	Demonstrate use of marine engine installation manuals.

	02.05 Demonstrate use of manufacture’s service bulletins.
	02.06 Apply processes to create quotes and estimates which include, but are not limited to, parts and labor.
03.0	Develop skills in electrical-electronic theory of operation and application.-The student will be able to:
	03.01 Apply Ohm's Law to series circuit.
	03.02 Apply Ohm's Law to parallel circuits.
	03.03 Apply Ohm's Law to series-parallel circuits.
	03.04 Perform continuity test.
	03.05 Describe the theory and operation of alternators.
	03.06 Diagnose and repair or replace charging system regulator.
	03.07 Service or replace battery cables and battery box.
	03.08 Diagnose, repair or replace starter.
	03.09 Diagnose and repair malfunctions in the cranking system.
	03.10 Perform operational inspection of lighting system.
	03.11 Measure voltage drops, current flow, resistance in a circuit or component with a multi-meter.
	03.12 Repair or replace switches to include ignition switches.
	03.13 Repair or replace fuse block assembly.
	03.14 Locate and repair shorts and open circuits in wiring.
	03.15 Inspect or replace rectifier.
	03.16 Replace diode assembly.
	03.17 Remove, replace and repair electrical remote control assembly.
	03.18 Service and install diesel and gasoline marine alarm systems.
04.0	Identify special marine principles.-The student will be able to:
	04.01 Explain basic principles of thrust in marine applications.
	04.02 Explain basic principles of propulsion in marine applications.
	04.03 Explain correct propeller selection and performance.
	04.04 Identify types of hulls used in marine applications.
	04.05 Explain speed-length ratio and calculate hull speed and engine selection.
	04.06 Identify bow angle and its effect on performance.
	04.07 Identify transom heights and explain the effects on engine performance/speed/horsepower.

05.0	Perform corrosion experiments and understand corrosion control.-The student will be able to:
05.01	Identify galvanic corrosion.
05.02	Explain the use and function of the galvanic series.
05.03	Understand corrosion and its prevention.
05.04	List chemical equation and symbols.
05.05	Demonstrate a basic knowledge of electricity.
05.06	Identify maintenance of boat hulls and when to determine its time.
05.07	Identify difference in corrosion and cavitation.
05.08	Demonstrate cause of corrosion.
05.09	List in test form, actual reports in the lab.
05.10	Distinguish fatigue corrosion.
05.11	Understand electrolysis and its causes of corrosions.
05.12	Correctly prepare metals for protective coatings.
05.13	Identify protective coatings.
05.14	Demonstrate theory of operation of impress currents.
05.15	Show proper installation procedure of impress current unit onboard ship.
05.16	Maintain records and diagnose impress current failure.
05.17	Write report analysis on corrosion in our environment.
05.18	Identify non-metallic corrosion.
05.19	Define special tools used in the maintenance and testing of sacrificial anodes.
05.20	Understand acrylic and styrene copolymer coating.
05.21	List causes of stray current corrosion.
06.0	Apply fiberglass construction and maintenance procedures.-The student will be able to:
06.01	Describe safe handling procedures and care of fiberglass resins and materials.
06.02	Apply mixture methods of resins, gel coat and paints.
06.03	Describe fiberglass boat manufacturing concepts.
06.04	Prepare a mold for casting a fiberglass hull.
06.05	Describe installation procedures of decks and gunwale.
06.06	Repair damaged fiberglass hulls.

	06.07 Apply modern methods of maintaining new and old fiberglass hulls.
	06.08 Demonstrate advance methods of boat building and the manufacturing of fiberglass accessories.
07.0	Demonstrate appropriate communication skills.-The student will be able to:
	07.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	07.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	07.03 Read and follow written and oral instructions.
	07.04 Answer and ask questions coherently and concisely.
	07.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	07.06 Demonstrate appropriate telephone/communication skills.
08.0	Demonstrate appropriate math skills.-The student will be able to:
	08.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	08.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	08.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	08.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	08.05 Demonstrate an understanding of federal, state and local taxes and their computation.
09.0	Demonstrate appropriate understanding of basic science.-The student will be able to:
	09.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	09.02 Draw conclusions or make inferences from data.
	09.03 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	09.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
10.0	Demonstrate employability skills.-The student will be able to:
	10.01 Conduct a job search.
	10.02 Secure information about a job.
	10.03 Identify documents which may be required when applying for a job interview.
	10.04 Complete a job application form correctly.
	10.05 Demonstrate competence in job interview techniques.
	10.06 Identify and adopt acceptable work habits.
	10.07 Demonstrate knowledge of how to make appropriate job changes.

10.08	Demonstrate acceptable employee health habits.
10.09	Describe the Federal Law as recorded in (29 CFR-1910.1200).
11.0	Develop skills in Auxiliary systems.-The student will be able to:
11.01	Familiarize with fire protection systems.
11.02	Compare the Code of Federal Regulations (CFR) to ABYC A-4 as it applies to recreational craft and firefighting equipment.
11.03	Discuss currently used fire extinguishing agent characteristics
11.04	Practice measuring engine room compartments and tankage volumes to determine net compartment volume and correct sizing of extinguishing agent bottle systems.
11.05	Inspect engine rooms on boats and "spec out" a design for a permanently installed automatic system to include a full system layout with wiring schematic.
11.06	Install and service on-board liquefied petroleum gas and compressed natural gas systems.
11.07	Identify the differences between LPG and CNG gasses.
11.08	Inspect CO detectors and review standard installation procedures with live units.
11.09	Practice assembling a typical LPG system.
11.10	Inspect approved appliances and identify the features that make them Standards compliant.
11.11	Inspect examples of all of the systems and devices covered and identify the key points mentioned within the respective standards.
11.12	Compare the differences between global LPG installation Standards and ABYC Standards.
11.13	Install and Repair Piping and Plumbing/Potable Water Systems.
11.14	Drill and prepare cored composite hull for installation of a seacock and learn the importance of isolation of metallic thru-hull fittings on aluminum and steel vessels.
11.15	Inspect bilge pump and scupper installations on a variety of boats in the IYRS collection to determine compliance with the two ABYC standards.
11.16	Design and build a potable hot and cold water system mock up to include a pressurized system.
11.17	Inspect gray water systems on new boats and then design a system based on equipment manufacturer’s recommendations, building a small mockup in the lab.
11.18	Practice the procedures necessary to properly decommission a potable water system after discussing the proper procedures for commissioning and decommissioning on board plumbing systems.
11.19	Familiarized with specific information regarding onboard tankage for fuel, water and waste.
11.20	Review ABYC Standards and USCG Federal Regulations as they apply to Gasoline and Diesel Fuel tank design and installations.
11.21	Recognize potable water storage tank requirements and ABYC Standard H-23, Potable Water Systems.
11.22	Identify issues related to waste holding tanks and cover best industry practices for their design and installation.
11.23	Learn to troubleshoot and repair tank level gauge problems.

11.24	Familiarize the student with a variety of steering system types available for power and sailing craft.
11.25	Review basic hydraulic principles as applied to steering systems, component placement and bleeding procedures as specified by the various vendors.
11.26	Review ABYC Standard P-21, Manual Hydraulic Steering Systems.
11.27	Practice selecting a system for several hypothetical boat types.
11.28	Practice steering system maintenance and adjustment procedures on steering system mock-ups.
11.29	Examine the three ABYC Standards that address steering or propulsion control systems, P-22, Steering Wheels, P-23 Steering and Propulsion Controls for Jet Boats, and P-24 Electric/Electronic Propulsion Control Systems.
11.30	Demonstrate knowledge of Federal and local regulations related to waste water systems.
11.31	Identify Federal Laws as they apply to marine sanitation systems as installed on boats and compile a written report on regional and local laws as they apply to marine sanitation devices and overboard discharge of gray water and black water.
11.32	Inspect systems to determine if the design criteria of the MSD's installation have been met and how to service anti-siphon systems and deal with the problem of a system blockage.
11.33	Provide further detail to the typical type two manually operated systems most common on recreational boats, commissioning and decommissioning, and routine servicing of the various systems.
11.34	Inspect a vacuum-flush system and their specialized installation, design and service requirements.
11.35	Use of auxiliary power systems and gen-sets.
11.36	Installation, maintenance & repair of direct current generators.
11.37	Installation, maintenance & repair of alternate current generators.
11.38	Installation, maintenance & repair of governors.
11.39	Bow Thrusters, stabilizers, and stabilizing systems.
11.40	Discuss various types of thrusters.
11.41	How bow & stern thrusters operate.
11.42	Maintenance and repair of thruster systems.
11.43	Discuss various types of stabilizers & systems.
11.44	Define: Heave, pitch, yaw, sway, and roll.
11.45	Maintenance & repair of stabilizers & stabilizing systems.
11.46	Principles of air conditioning and refrigeration systems on marine vessels.
11.47	Discuss destruction of ozone by chlorine and HCFC refrigerants.
11.48	Understand the refrigeration cycle.
11.49	Determine EPA requirements for refrigeration.
11.50	Working with refrigeration evacuation and recovery equipment.

11.51 Troubleshooting refrigeration & A/C equipment.
11.52 Demonstrate single and double flaring of copper piping.
11.53 Understanding Hydraulic Systems.
11.54 Describe the principle of Hydraulic systems.
11.55 Understanding hydraulic cylinders, actuators, and pressures.
11.56 Troubleshooting hydraulic systems.
11.57 Maintenance & repair of hydraulic systems.
11.58 Describe types of windlass systems.
11.59 Describe components of a windlass system and how they are used: bitter end, bits gypsies/wildcats, and devil's claw.
11.60 Installation, maintenance & repair of windlass systems.
11.61 Describe different methods of desalinization.
11.62 Define the components of a desalinization systems.
11.63 Maintenance & repair of desalinization systems.

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)

SkillsUSA is the intercurricular career and technical student organization 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 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: **Professional Welder**
Career Cluster: **Transportation, Distribution and Logistics**

CCC	
CIP Number	0647060516
Program Type	College Credit Certificate (CCC)
Standard Length	16 Credits
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3051 - Motorboat Mechanics and Service Technicians 49-9071 - Maintenance and Repair Workers, General 51-4121 – Welders, Cutters, Solderers, and Brazers 51-4122 - Welding & Brazing Machine Setters, Operators & Tenders

Purpose

This certificate program is part of the Marine Engineering, Management & Seamanship AAS degree program 0647060500.

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics 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 Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to industry safety practices, common hazards, personal protective equipment, welding techniques and positions using multiple welding processes including shielded metal ARC welding, gas metal ARC welding, and gas tungsten ARC welding.

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

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Program Structure

This program is a planned sequence of instruction consisting of 16 credit hours.

Standards

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

01.0 Perform basic shop practices.
02.0 Use service manuals and parts references.
03.0 Perform basic welding skills.
04.0 Perform corrosion experiments and understand corrosion control.
05.0 Demonstrate appropriate communication skills.
06.0 Demonstrate appropriate math skills.
07.0 Demonstrate appropriate understanding of basic science.
08.0 Demonstrate an understanding of entrepreneurship.
09.0 Auxiliary systems.

Florida Department of Education
Student Performance Standards

Program Title: **Professional Welder**
CIP Numbers: **0647060516**
Program Length: **16 credit hours**
SOC Code(s): **49-3051, 49-9071, 51-4121, 51-4122**

This certificate program is part of the Marine Engineering, Management, and Seamanship AAS degree program (064706500). At the completion of this program, the student will be able to:	
01.0	Perform basic shop practices.-The student will be able to:
01.01	Perform calculations with square roots and percentage.
01.02	Change fractions to decimals and decimals to fractions.
01.03	Understand the basic concepts of force, work, power, and motion.
01.04	Determine metric system measurements.
01.05	Comply with safety rules and regulations.
01.06	Understand the basic concepts of technical drawing including orthographic projections, isometric, schematics, and measurements.
01.07	Understand the concept of friction and the different types of mechanical friction.
01.08	Operate hand tools safely and properly.
01.09	Set up and use power tools safely and properly.
01.10	Set up and use precision measuring tools.
01.11	Drill and remove broken studs and install helicoils.
01.12	Identify threaded fasteners by size, type, thread series, thread classes, material hardness and compatibility.
01.13	Install fasteners such as screws, bolts and keys; and utilize screw extractor, thread cutting tape and dies.
01.14	Locate and match electrical units by their symbols on a wiring diagram.
01.15	Identify engine specifications and recommended propeller selection based on manufacture’s engine data.
02.0	Use service manuals and parts references.-The student will be able to:
02.01	Demonstrate use of manufacturer parts catalogs.
02.02	Demonstrate use of manufacture’s service bulletins.
03.0	Perform basic welding skills.-The student will be able to:
03.01	Set up and operate gas and electric various welding equipment.

	03.02 Burn (cut) material using mechanized or hand-held gas torch equipment.
	03.03 Prepare metal surfaces for welding.
	03.04 Identify type of metal to be welded.
	03.05 Fabricate metal frames and structures.
	03.06 Pressure test weldment.
	03.07 Perform plug weld technique.
	03.08 Gas weld ferrous metals in all positions with or without filler rod.
	03.09 Perform TIG welding in aluminum and stainless steel.
	03.10 Use and maintain TIG welding equipment.
	03.11 Perform MIG type welding on various metals.
	03.12 Use welding principles to heat and remove broken screws and bolts.
04.0	Perform corrosion experiments and understand corrosion control.-The student will be able to:
	04.01 Demonstrate a basic knowledge of electricity.
	04.02 Identify protective coatings.
05.0	Demonstrate appropriate communication skills.-The student will be able to:
	05.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	05.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	05.03 Read and follow written and oral instructions.
	05.04 Answer and ask questions coherently and concisely.
	05.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	05.06 Demonstrate appropriate telephone/communication skills.
06.0	Demonstrate appropriate math skills.-The student will be able to:
	06.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	06.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	06.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
07.0	Demonstrate appropriate understanding of basic science.-The student will be able to:
	07.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	07.02 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.

	07.03 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
08.0	Demonstrate an understanding of entrepreneurship.-The student will be able to:
	08.01 Define entrepreneurship.
	08.02 Describe the importance of entrepreneurship to the American economy.
	08.03 List the advantages and disadvantages of business ownership.
	08.04 Identify the risks involved in ownership of a business.
	08.05 Identify the necessary personal characteristics of a successful entrepreneur.
	08.06 Identify the business skills needed to operate a small business efficiently and effectively.
09.0	Auxiliary systems.-The student will be able to:
	09.01 Familiarize with fire protection systems.
	09.02 Discuss currently used fire extinguishing agent characteristics

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)

SkillsUSA 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.

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 AAS degree program includes the following College Credit Certificates:

Marine Electrician (0647060506) – 12 credit hours
Marine Propulsion Technician (0647060505) – 24 credit hours
Marine Systems Technician (0647060513) - 24 credit hours
Marine Technology (0647060512) – 34 credit hours
Professional Welder (0647060516) – 16 credit hours

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